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SOIL. AGRICULTURE. ENVIRONMENT.

Agricultural Assessment for the Proposed Soyuz 6 Wind Energy Facility, Northern Cape Province

28 February 2023

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1. Introduction

Terra-Africa Consult cc was appointed by Soyuz 6 (Pty) Ltd. to conduct the Agricultural Assessment for the proposed development of a commercial Wind Energy Facility (WEF). The applicant Soyuz 6 (Pty) Ltd is proposing the development of a commercial Wind Energy Facility (WEF) and associated infrastructure on a site located approximately 53 km South East of Britstown within the Ubuntu Local Municipality and the Pixley ka Seme District Municipality in the Northern Cape Province.

Five additional WEF's are concurrently being considered on the surrounding properties and are assessed by way of separate impact assessment processes contained in the 2014 Environmental Impact Assessment Regulations (GN No. R982, as amended) for listed activities contained in Listing Notices 1, 2 and 3 (GN R983, R984 and R985, as amended). These projects are known as Soyuz 1 WEF, Soyuz 2 WEF, Soyuz 3 WEF, Soyuz 4 WEF and Soyuz 5 WEF.

A preferred project site with an extent of approximately 125 000 ha has been identified as a technically suitable area for the development of the six WEF projects. It is proposed that each WEF will comprise of up to 75 turbines with a contracted capacity of up to 480 MW. It is anticipated that each WEF will have an actual (permanent) footprint of up to 150 ha.

The Soyuz 6 WEF project site covers approximately 17 800 ha and comprises the following farm portions:

- Remaining Extent of Portion 3 of the Farm No. 16.
- Remaining Extent (Portion 0) of the Farm No 16.
- Remaining Extent (Portion 0) of the Farm No 141.
- Remaining Extent (Portion 0) of the Farm No. 148.
- Portion 4 of the Farm No. 16.
- The Farm No. 157.
- The Farm No. 156.
- Portion 2 (a portion of Portion 13) of the Farm Wonderboom No. 13.
- Portion 1 of the Farm Wonderboom No. 13.
- Remaining Extent of Portion 1 of the Farm Sterkfontein No. 12.

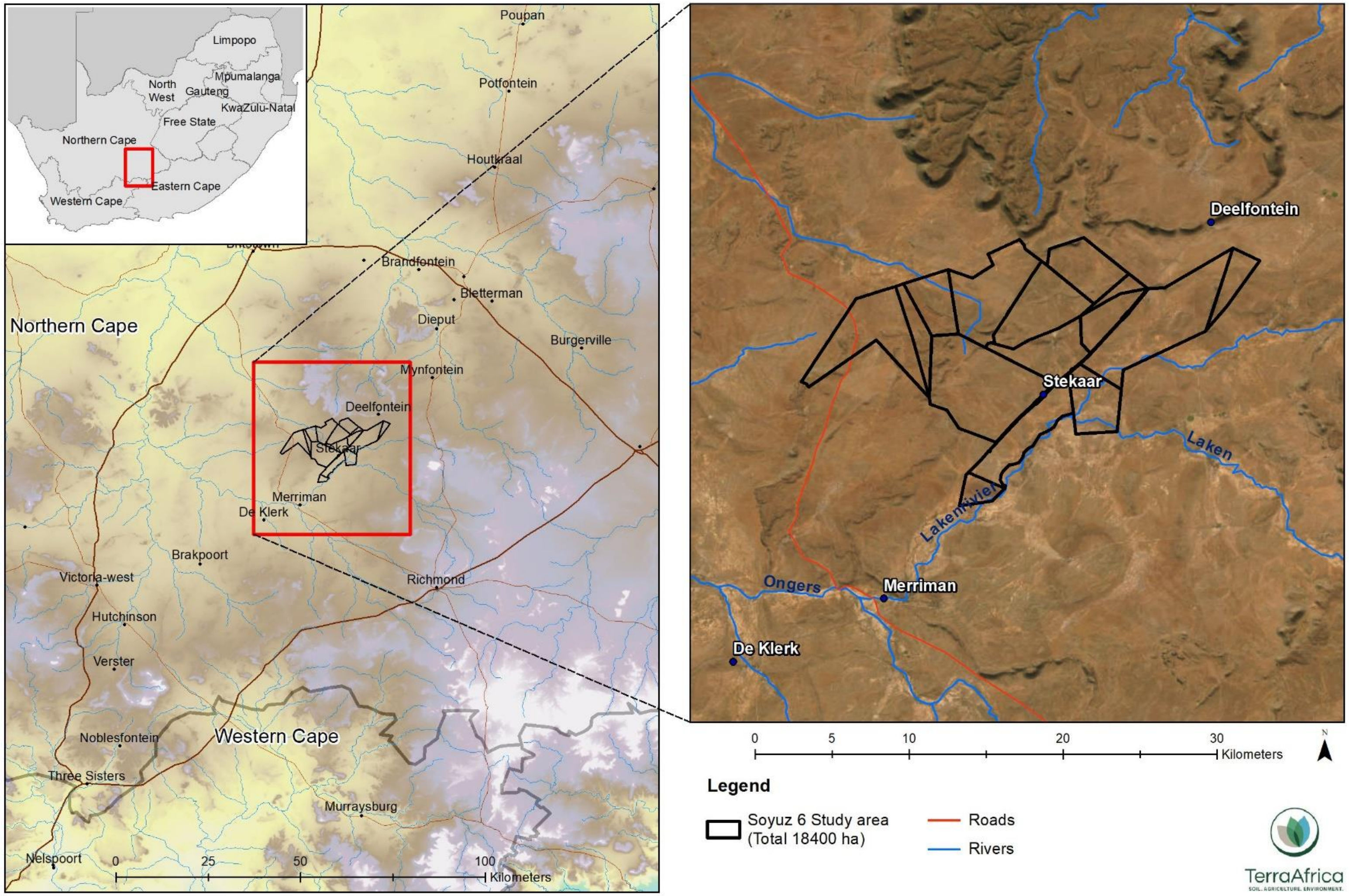

Figure 1 Locality of the proposed site.

2. Project description

The Soyuz 6 WEF project site is proposed to accommodate the following infrastructure, which will enable the wind farm to supply a contracted capacity of up to 480 MW:

- Up to 75 wind turbines with a maximum hub height of up to 160 m and a rotor diameter of up to 200 m;
- A transformer at the base of each turbine;
- Concrete turbine foundations of up to 1024 m2 each;
- Permanent Crane hardstand / blade and tower laydown area / crane boom erection area with a combined maximum footprint 5000 m2 at each WTG;
- Temporary concrete batch plants to be located at the construction camp area and the satellite laydown areas;
- Battery Energy Storage System (with a footprint of up to 5 ha);
- Internal up to 132 kV overhead lines between substations. A 300m wide corridor (150m on either side of the proposed route) has been considered to allow for any technical and environmental sensitivity constraints identified during micro-siting prior to layout finalisation. Permanent service roads will be required for the construction and maintenance of the overhead lines. In areas where these overhead lines do not follow an existing or proposed road, additional roads of up to 3m in width will be required. Temporary construction areas beneath each overhead line tower position will also be required;
- Medium voltage (33 kV) cables/powerlines running from wind turbines to the facility substations. The routing will follow existing/proposed access roads and will be buried where possible. If the use of overhead lines is required, the Avifaunal Specialist will be consulted timeously to ensure that a raptor friendly pole design are used, and that appropriate mitigation is implemented pro-actively.
- Up to six permanent met masts;
- Three substations and operation and maintenance facilities (up to 4 ha each) as well as a laydown area (8 000 m2) at each substation for the electrical contractor. Operation and maintenance facilities include a gate house, security building, control centre, offices, warehouses and workshops.
- Three temporary main construction camp areas (up to 12.25 ha each);
- Twelve temporary satellite laydown areas (5 000 m2 each).
- Access roads to the site and between project components inclusive of stormwater infrastructure. A 200 m road corridor is being applied for to allow for slight realignments pending technical and environmental sensitivity constraints identified during micro-siting prior to layout finalisation. The final road will have maximum width of 12 m (within the 200 m corridor.

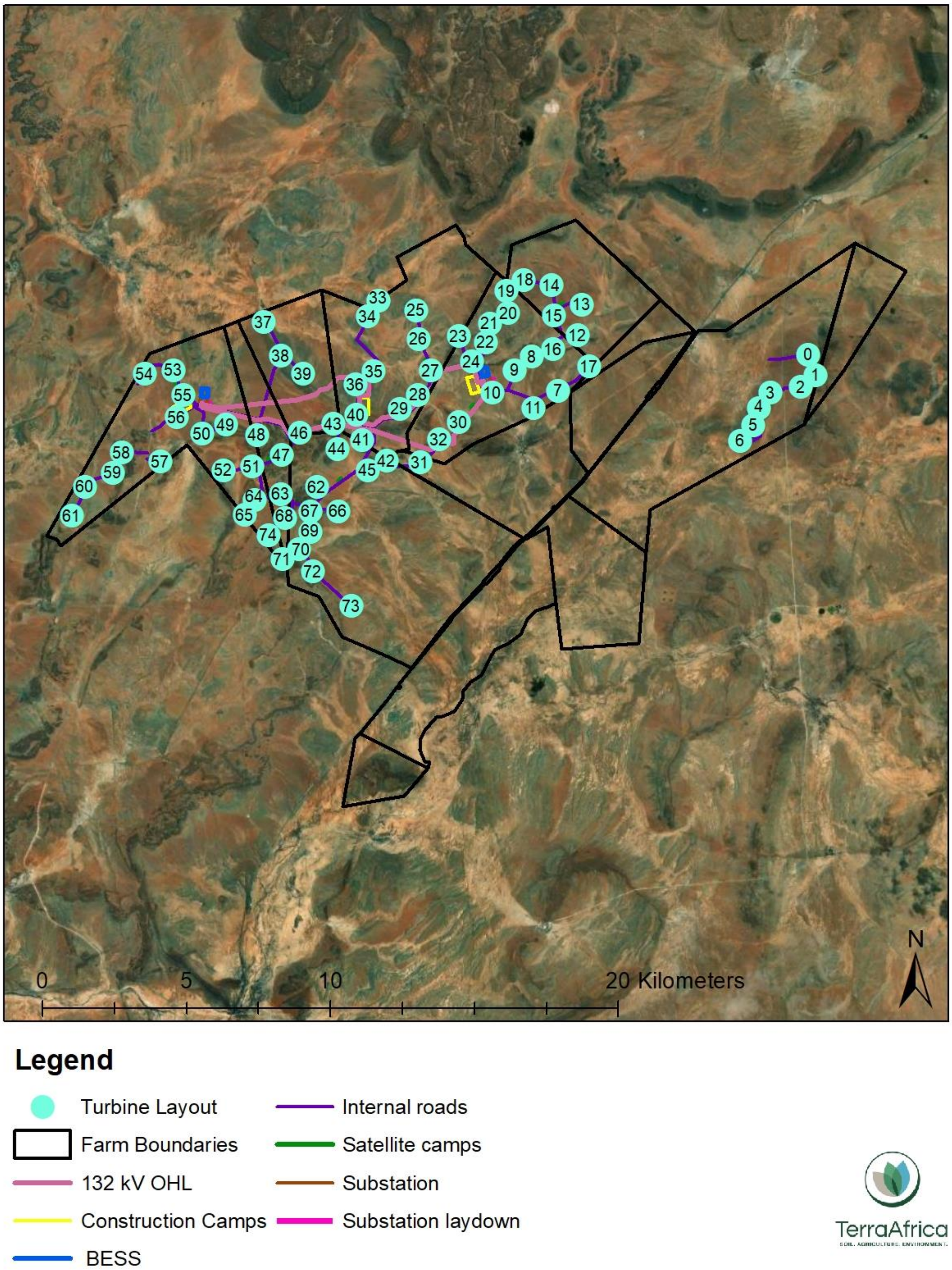

Figure 2 Layout map of the proposed Soyuz 6 WEF project site.

3. Details of 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.

Jan-Dirk is a candidate scientist registered with the South African Council for Natural Scientific Professions (SACNASP) and is specialized in the field of Soil Science. His SACNASP registration number is 400274/13. Jan-Dirk holds a BSc. Degree in Agricultural Science (with specialization in Soil Science) from the University of the Free State and a MSc. Degree in Soil Science from the University of the Free State.

4. Purpose and objectives of the agricultural assessment

The purpose of the agricultural assessment is to ensure that the sensitivity of the project site from the perspective of agricultural production to the proposed development, is sufficiently considered. To meet this objective, site sensitivity verification must be conducted, of which the results must meet the following objectives:

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

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

- be applicable to the preferred site and the proposed development footprint;
- confirm that the site is of "low" or "medium" sensitivity for agriculture; and

- indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site.

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

Table 1 GNR 320 requirements of an agricultural assessment Statement (Low to Medium Sensitivity)

Requirement	Report reference
3.1. The agricultural assessment must be prepared by a soil scientist or agricultural specialist registered with the SACNASP.	Page 5 & Appendix 1
3.2. The agricultural assessment must: 3.2.1. be applicable to the preferred site and proposed development footprint;	Section 9
3.2.2. confirm that the site is of "low" or "medium" sensitivity for agriculture; and	Section 9.5
3.2.3. indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site.	Section 9.5 and Section 12
3.3. The agricultural assessment must contain, as a minimum, the following information: 3.3.1. contact details and relevant experience as well as the SACNASP registration number of the soil scientist or agricultural specialist preparing the assessment including a curriculum vitae;	Page 5, Appendices 1, 2 and 3
3.3.2. a signed statement of independence;	Appendix 1
3.3.3. a map showing the proposed development footprint (including supporting infrastructure) with a 50m buffered development envelope, overlaid on the agricultural sensitivity map generated by the screening tool;	Figure 3
3.3.4. confirmation from the specialist that all reasonable measures have been taken through micro- siting to avoid or minimise fragmentation and disturbance of agricultural activities;	Section 12
3.3.5. a substantiated statement from the soil scientist or agricultural specialist on the acceptability, or not, of the proposed development and a recommendation on the approval, or not, of the proposed development;	Section 12
3.3.6. any conditions to which the statement is subjected;	Section 12
3.3.7. in the case of a linear activity, confirmation from the agricultural specialist or soil scientist, that in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;	N/A
3.3.8. where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr; and	Section 11
3.3.9. a description of the assumptions made as well as any uncertainties or gaps in knowledge or data.	Section 8
3.4. A signed copy of the agricultural assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	Submitted as part of final report

5. Terms of reference

Following the stipulations of GN320 of NEMA (published 20 March 2020), the scope of the agricultural assessment will include:

- Conduct a desktop assessment of the baseline soil and agricultural properties for the proposed project site
- A proper description of the agro-ecosystem of each project site that includes soil classification and terrain analysis.
- An analysis of the current land productivity and land uses and determination whether agriculture is a financially viable and sustainable land use option.
- Determination of existing negative impacts on agricultural productivity of the proposed sites such as the presence of waste dump areas, alien vegetation and existing land degradation.
- Determination of the site sensitivity to the proposed projects and calculation of whether the project infrastructure layout will fall within the allowable development limits or exceed it.
- Assessment of the impacts that a change in land use from agriculture to renewable energy generation will have on both farm productivity as well as agricultural employment.
- Recommendation of mitigation and management measures to reduce the significance of the anticipated impacts.

6. Legislative framework of the assessment

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

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

- the Conservation of Agricultural Resources Act (No 43 of 1983) (CARA) states that the degradation of the Land capability of soil is illegal. CARA requires the protection of land against soil erosion and the prevention of water logging and salinisation of soils by means of suitable soil conservation works to be constructed and maintained. The utilisation of marshes, water sponges and watercourses are also addressed; and

- the National Water Act (No 36 of 1998) (NWA) deals with the protection of water resources (i.e. wetlands and rivers). Hydric soils with wetland land capability are not part of the proposed project site and the NWA is therefore not applicable.

7. Agricultural sensitivity

For the purpose of the assessment, the project site of the Soyuz 6 WEF, was screened for agricultural sensitivity using the National Environmental Screening Tool (www.screening.environment.gov.za). The screening report for the project site was generated by (DFFE, 2023) and presented as Figure 3. The requirements of GN320 stipulates that a 50m buffered development envelope must be assessed with the screening tool.

The screening tool report has assigned a larger area of land a Medium sensitivity rating intersperse with smaller areas of Low sensitivity. These areas have likely been assigned higher sensitivity as a result of the land capability of Low-Moderate (Class 06) of these areas according to DALRRD (2016). The screening tool report has assigned High sensitivity to both the two small areas of crop fields.

In alignment with the CARA, the Department of Agriculture, Land Reform and Rural Development (DALRRD) developed spatial data that depict High Potential Agricultural Areas (HPAAs) of the different provinces of South Africa (DALRRD, 2019). According to the DALRRD, these areas can be defined as: *“large, relative homogeneous portions of high value agricultural land that has the potential to sustainably, in the long-term, contribute significantly to the production of food.”*

The results show that the entire project does not overlap with any HPAA. The nearest HPAA is the Smart Syndicate PAA, a Category B Irrigation area, that is located about 65 km northwest of the project site.

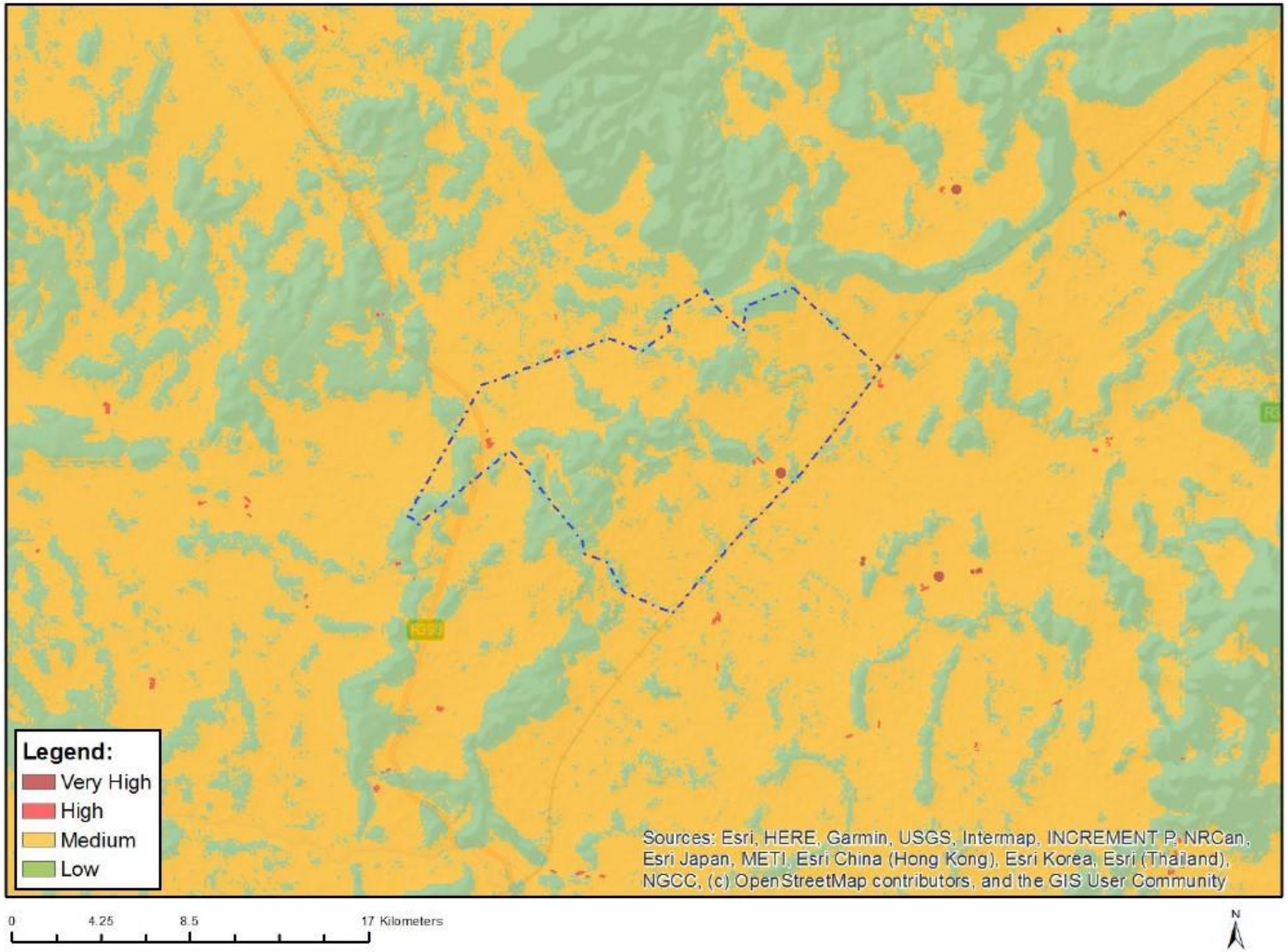

Figure 3 Relative Agricultural Sensitivity from DFFE's Screening Tool of the Soyuz 6 WEF (DFFE, 2023).

Figure 4 Position of High Agricultural Areas around the Soyuz 6 WEF project site (data source: DALRRD, 2021).

8. Methodology

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

8.1 Assessment of available data

The most recent aerial photography of the area available from Google Earth was obtained. The satellite imagery was used to analyse the terrain of the proposed project site and the surrounding area. The analysis considered the slope, typical terrain units and landscape features, such as existing roads, farm infrastructure and areas where land degradation may be present. The proposed project site was also superimposed on five different raster data sets obtained from the National Department of Agriculture, Land Reform and Rural Development (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 long-term grazing capacity for South Africa 2018 that present the long-term grazing capacity of an area with the understanding that the veld is in a relatively good condition (South Africa, 2018).
- The (Northern Cape Province) Field Crop Boundaries show crop production areas may be present within the project site. 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: (Northern Cape 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).

8.2 Site assessment

The site visit was conducted to ensure that all the properties within the project site, could be assessed for soil classification. The site visit was done from the 12th of September to the 28th of September during Spring. The soil profiles were examined to a maximum depth of 1.4 m using a hand-held auger. Observations on site were made regarding soil texture, structure, colour and soil depth at each survey point. The locality of each survey point is shown in Figure 5. A cold 10% hydrochloric acid solution was used on site to test for the presence of carbonates in the soil. Qfield software were used to the log the coordinates of each of the survey points. The soils are described using Soil Classification: A Natural and Anthropogenic System for South Africa (Soil Classification Working Group, 2018).

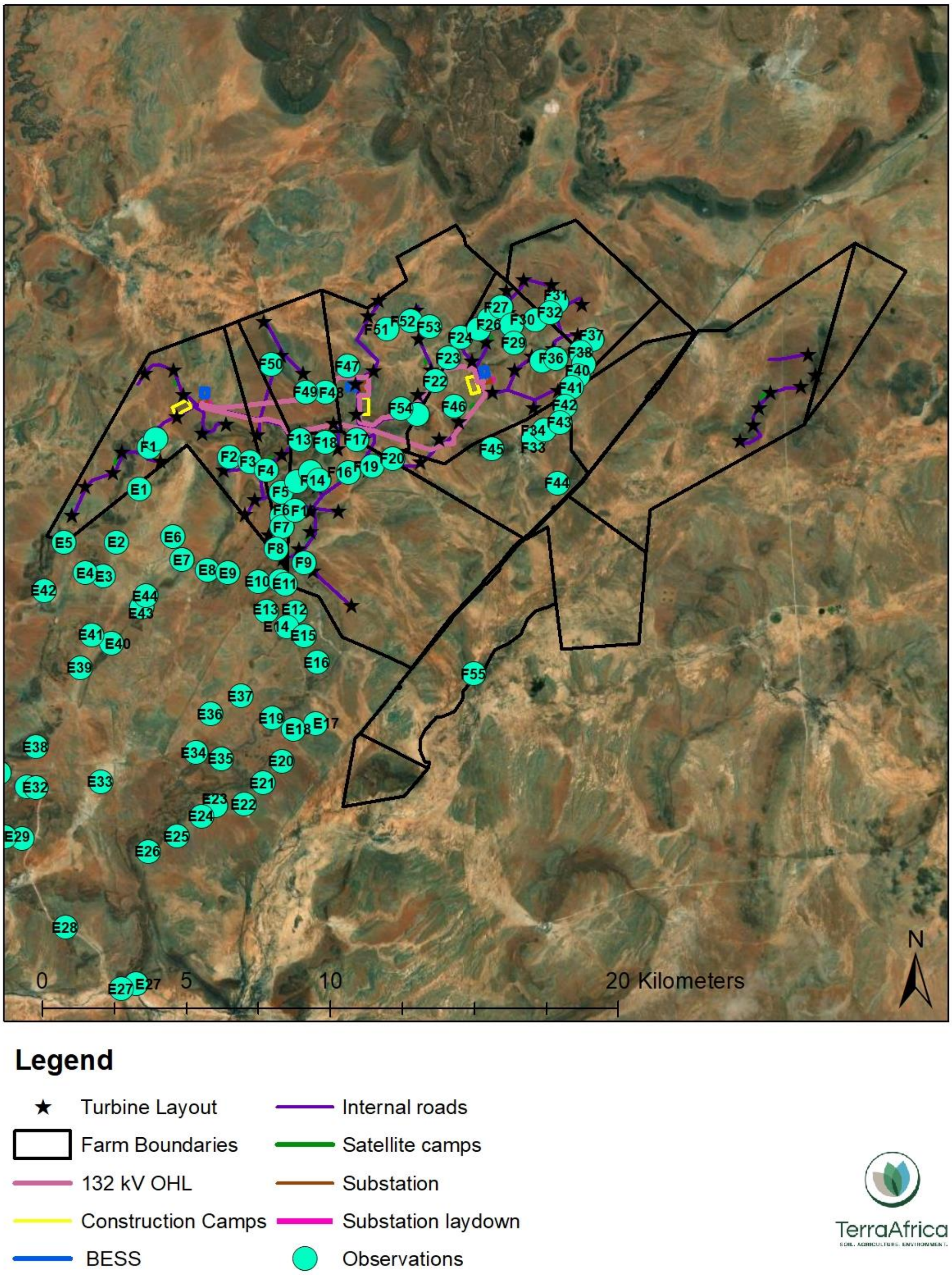

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Figure 5 Locality of on-site soil classification and observation points within the Soyuz 6 WEF project site.

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

8.3 Impact assessment methodology

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CES has developed an evaluation criterion of impacts in accordance with the requirements of the EIA Regulations (2014, as amended). This scale takes into consideration the following variables:

- Nature: negative or positive impact on the environment.
- Type: direct, indirect and/or cumulative effect of impact on the environment.
- Significance: The criteria in Table 2 are used to determine the overall significance of an activity. The impact effect (which includes duration; extent; consequence and probability) and the reversibility/mitigation of the impact are then read off the significance matrix in order to determine the overall significance of the issue. The overall significance is either negative or positive and will be classified as low, moderate or high (Table 3).
- Consequence: the consequence scale is used in order to objectively evaluate how severe a number of negative impacts might be on the issue under consideration, or how beneficial a number of positive impacts might be on the issue under consideration.
- Extent: the spatial scale defines the physical extent of the impact.
- Duration: the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
- Probability: the likelihood of impacts taking place as a result of project actions arising from the various alternatives. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development and alternatives. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.
- Reversibility: The degree to which an environment can be returned to its original/partially original state.
- Irreplaceable loss: The degree of loss which an impact may cause.
- Mitigation potential: The degree of difficulty of reversing and/or mitigating the various impacts ranges from very difficult to easily achievable. The four categories used are listed and explained in Table 2 below. Both the practical feasibility of the measure, the potential cost and the potential effectiveness is taken into consideration when determining the appropriate degree of difficulty.

Table 2 Ranking of Evaluation Criteria

NATURE	
Positive	Beneficial/positive impact.
Negative	Detrimental/negative impact.
TYPE	
Direct	Direct interaction of an activity with the environment.
Indirect	Impacts on the environment that are not a direct result of the project or activity.
Cumulative	Impacts which may result from a combination of impacts of this project and similar related projects.
DURATION	
Short term	Less than 5 years.
Medium term	Between 5-20 years.
Long term	More than 20 years.
Permanent	Over 40 years or resulting in a permanent and lasting change that will always be there.
EXTENT	
Localised	Impacts affect a small area of a few hectares in extent. Often only a portion of the project site.
Study area	The proposed site and its immediate environments.
Municipal	Impacts affect the municipality, or any towns within the municipality.
Regional	Impacts affect the wider district municipality or the Eastern Cape Province as a whole.
National	Impacts affect the entire country.
International/Global	Impacts affect other countries or have a global influence.
CONSEQUENCE	
Slight	Slight impacts or benefits on the affected system(s) or party(ies).
Moderate	Moderate impacts or benefits on the affected system(s) or party(ies).
Severe/ Beneficial	Severe impacts or benefits on the affected system(s) or party(ies).
PROBABILITY	
Definite	More than 90% sure of a particular fact. Should have substantial supportive data.
Probable	Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact, or of the likelihood of an impact occurring.
REVERSIBILITY	
Reversible	The activity will lead to an impact that can be reversed provided appropriate mitigation measures are implemented.
Irreversible	The activity will lead to an impact that is permanent regardless of the implementation of mitigation measures.
IRREPLACEABLE LOSS	
Resource will not be lost	The resource will not be lost/destroyed provided mitigation measures are implemented.
Resource will be partly lost	The resource will be partially destroyed even though mitigation measures are implemented.
Resource will be lost	The resource will be lost despite the implementation of mitigation measures.
MITIGATION POTENTIAL	
Easily achievable	The impact can be easily, effectively and cost effectively mitigated/reversed.
Achievable	The impact can be effectively mitigated/reversed without much difficulty or cost.
Difficult	The impact could be mitigated/reversed but there will be some difficultly in ensuring effectiveness and/or implementation, and significant costs.
Very Difficult	The impact could be mitigated/reversed but it would be very difficult to ensure effectiveness, technically very challenging and financially very costly.

Table 3 Description of significance ratings.

Significance Rating		Description
LOW NEGATIVE	**LOW POSITIVE**	The impacts on this issue are acceptable and mitigation, whilst desirable, is not essential. The impacts on the issue by themselves are insufficient, even in combination with other low impacts, to prevent the development being approved. Impacts on this particular issue will result in either positive or negative medium to short term effects on the social and/or natural environment.
MODERATE NEGATIVE	**MODERATE POSITIVE**	The impacts on this issue are important and require mitigation. The impacts on this issue are, by themselves, insufficient to prevent the implementation of the project, but could in conjunction with other issues with moderate impacts, prevent its implementation. Impacts on this particular issue will usually result in either a positive or negative medium to long-term effect on the social and/or natural environment.
HIGH NEGATIVE	**HIGH POSITIVE**	The impacts on this issue are serious, and if not mitigated, they may prevent the implementation of the project (if it is a negative impact). Impacts on this particular issue would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment, and will result in severe effects or if positive, substantial beneficial effects.

9. Study gaps, limitations, and assumptions

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

- It is assumed that the activities for the construction and operation of the infrastructure are limited to that typical for the construction and operation of a wind farm with up to 75 turbines.
- The assumption is made that the construction team that will install the turbines and associated infrastructure, are trained and knowledgeable in following best practice environmental management measures to minimize or avoid environmental degradation.
- It is assumed that the landowners will continue with farming activities around the wind turbines and supporting infrastructure and that the losses in agricultural productivity will be limited to the 150 ha development footprint of the infrastructure.
- It is also assumed that there will be no agricultural employment losses as a result of the proposed project.

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

10. Baseline description

10.1 Soil properties

The soil profiles classified within the Soyuz 6 WEF project site consist of the Mispah, Nkonkoni, Prieska, Swartland and Glenrosa soil form. The positions of the soil form are depicted in Figure 7 and a description of each soil form is provided following (Figure 6).

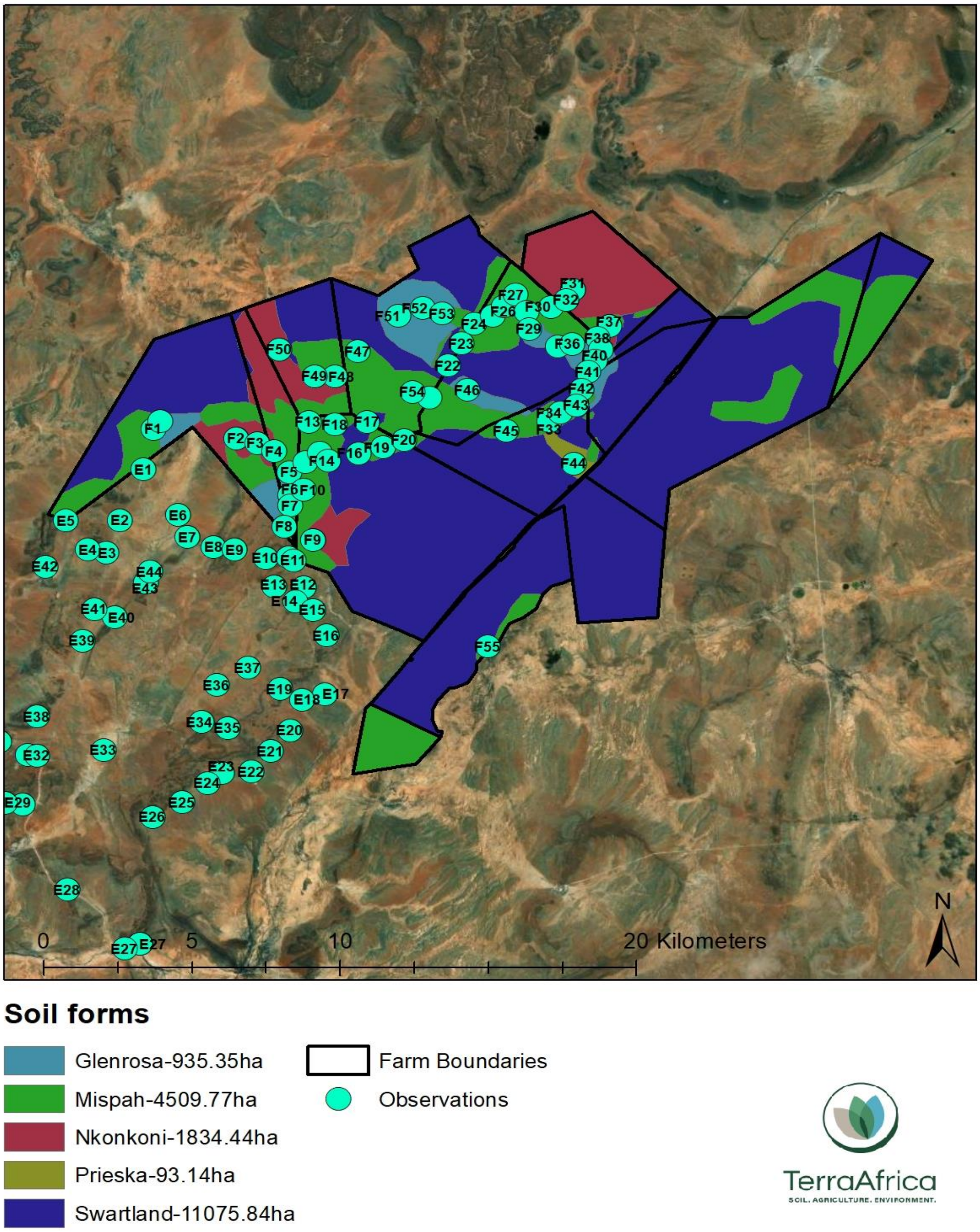

Figure 6 Soil classification map of Soyuz 6 WEF.

a) Mispah

The Mispah (4509.77ha) soil has shallow soil depths ranging from 0.1-0.3m, the Mispah covered second most of the study area. The effective soil depth of the Mispah soils is restricted by solid and fractured rock. The Mispah soil form is found mainly in the northern side with small areas in the south and north eastern side of the project site. The Mispah does not have a High or Medium agricultural sensitivity due to very shallow depth and restrictive layer. Thus, the soil form has a low agricultural sensitivity.

Figure 7 Mispah soil form

b) Glenrosa

The Glenrosa soil form is found at the bottom parts of the Mispah/Orcky outcrops and covered 935.35ha. The Glenrosa consists of an orthic A, overlying a lithic horizon. The lithic was saprolithic. Saprolithic is defined as a lithic horizon recognized by its soft to friable consistence and remnant crystalline structure due to advanced weathering of underlying parent rock material (Figure 8). Most of the area consist of rock of the Volksrust Fm, Waterford Fm of the Ecca Grp which are Siliciclastic rocks and the Karro Dolerite Sui consisting of Fine-grained felsic rocks. The Glenrosa is shallow with depths of 0.2m.

Figure 8 Glenrosa soil form.

c) Nkonkoni

The Nkonkoni soil form covered approximately 1834.44ha and is found in the northern and north western side of the project site. The Nkonkoni consists of an orthic A, overlying a red apedal with a lithic underneath (**Error! Reference source not found.**). The Nkonkoni had a moderate depth ranging from 0.5-0.8m and thus classified as a soil with medium agricultural sensitivity.

Figure 9 Nkonkoni soil form

d) Prieska

The Prieska soil form is found in the centre of the study area and covered approximately 93.14ha. The Prieska soil form consists of an orthic A overlying a neocarbonate with hard carbonate underneath. The neocarbonate had a depth of 0.5m whereafter the hard carbonate horizon is found. The Prieska soil form is not preferred for agricultural cultivation due to the shallow soil depth and limiting hard carbonate layer.

Figure 10 Prieska soil form

e) Swartland

The Swartland soil forms (**Error! Reference source not found.**) is found throughout the project site and covered the most of the area (11075.84ha). The Swartland soil form consist of an orthic horizon overlying a pedocutanic horizon with lithic material underneath. Cutans were clearly present within the pedocutanic horizon. The lithic horizon was also saprolthic as defined for the Glenrosa. The depth of the pedocutanic is 0.6m whereafter the lithic horizon is found.

Figure 11 Swartland soil form

10.2 Land capability

Following the classification of the soil, the consideration of other factors that influence rainfed crop production, and the capabilities of the climate (40%), Terrain (30%) and Soil (30%) of the project site, the land capability of the Soyuz 6 WEF was determined. The calculated land capability of the area is depicted in Figure 12.

The largest part of the Soyuz 6 WEF consist almost entirely of land with Very low (Class 02) and Low (Class 05) land capability. The Mispah soil form has Very low (Class 02) land capability due to the shallow depth and presence of rocky outcrops. The Swartland, Glenrosa and Prieska soil forms has Low (Class 05) land capability. Low-Moderate (Class 07) land capability is assigned to the Nkonkoni soil form. The areas with Moderate-High (Class 09) land capability measures 108.5 ha. These areas are where the rainfed and irrigated crop fields are in the western and centre parts of the project site.

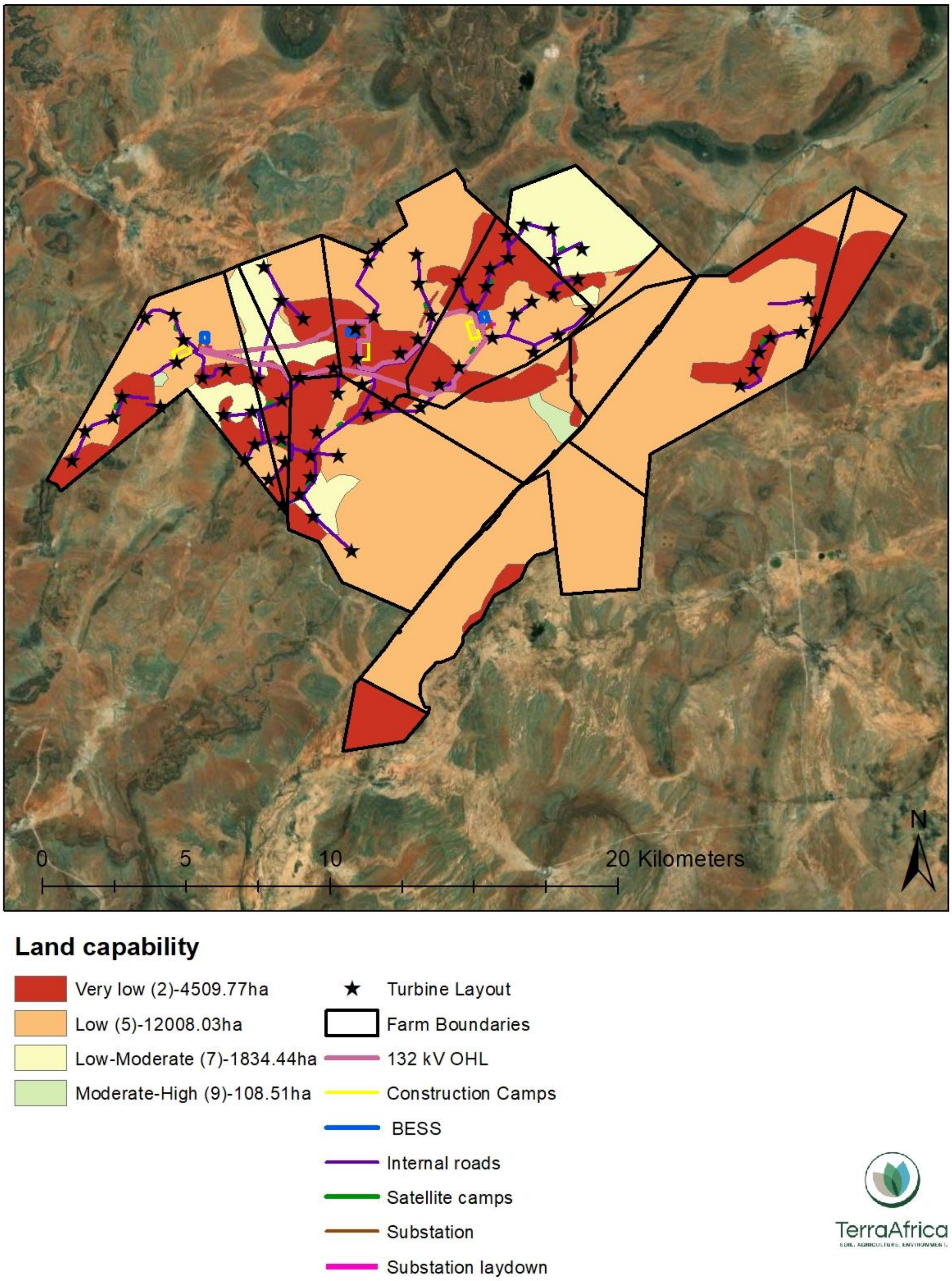

Figure 12 Land capability of the Soyuz 6 WEF.

10.3 Land use and agricultural activities

The Soyuz 6 WEF project site consist mainly of small stock farming (sheep). A few fields of rainfed crops and pastures are present within the site. These fields are located in the centre of the Remaining Extent of Portion 3 of the Farm No. 16 and along the western boundary of Portion 0 of the Farm 148. One pivot irrigated crop field is located on Portion 0 of the Farm 148.

Figure 13 Irrigated crop field on Portion 0 of the Farm 148.

The long-term grazing capacity of the area is 20 and 26 ha/LSU (DALRRD, 2018) (refer to **Error! Reference source not found.**Figure 14). The ideal grazing capacity is an indication of the long-term production potential of the vegetation layer growing in an area. More specifically, it relates to its ability to maintain an animal with an average weight of 450 kg (defined as 1 Large Stock Unit (LSU)), with an average feed intake of 10 kg dry mass per day over the period of approximately a year. This definition includes the condition that this feed consumption should also prevent the degradation of the soil and the vegetation. The grazing capacity is therefore expressed in a number of hectares per LSU (ha/LSU) (DALRRD, 2018).

Since the livestock farmed with at the project site is sheep, the grazing capacity was converted to Small Stock Units (SSU). One LSU equates to about 4 SSUs. The grazing capacity of the project site is therefore 5 ha/SSU for 20 ha/LSU and 6.5 ha/SSU for 26 ha/LSU. The entire development footprint of the Soyuz 3 WEF infrastructure will not exceed 150 ha, therefore the number of SSUs that will be lost from the farming potential of the entire project site, is forage of between 23 sheep (6.5 ha/SSU) and 30 sheep (5 ha/SSU).

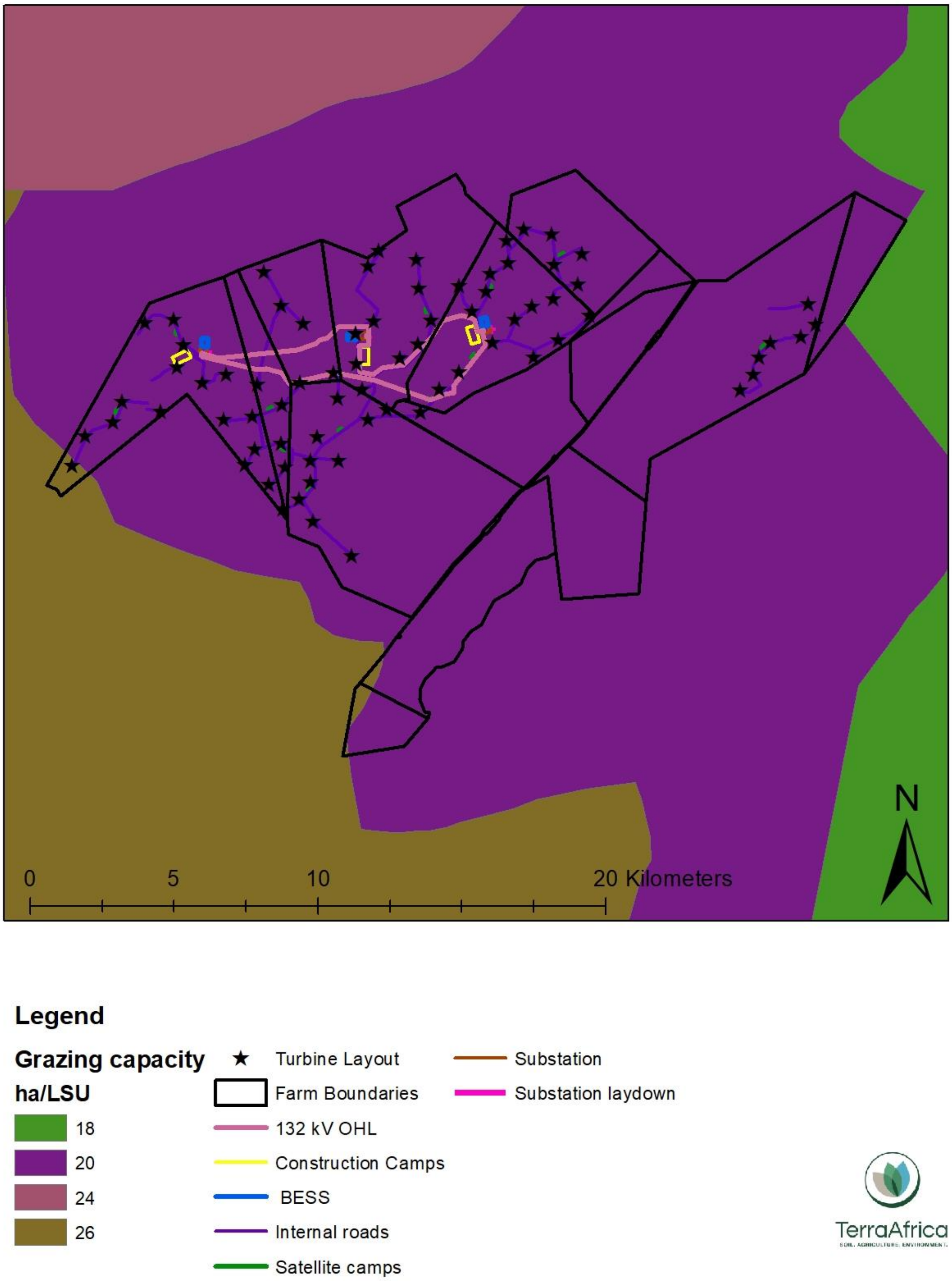

Figure 14 Grazing capacity of the Soyuz 6 WEF (data source: DALRRD, 2018).

10.4 Sensitivity analysis and allowable development limits

Following the consideration of all the desktop and gathered baseline data above, the study area can be classified as having areas with Low, Medium and High sensitivity to the proposed development (refer to Figure 15Figure 15). Areas where rainfed and irrigated crop fields are located, has been delineated as High sensitivity. During the processes of layout optimisation and micro-siting, all areas with High sensitivity were avoided.

Most of the infrastructure components have been placed in areas with Low agricultural sensitivity. Twelve wind turbines, and part of the 132Kv OHL fall in areas with Medium sensitivity.

The Low Sensitivity areas have shallow effective soil depth and the arid climate reduces the land capability of the area significantly. The area is mainly used for livestock grazing. Soil conservation and mitigation measures must be implemented to avoid soil particle loss through erosion as the soil regeneration potential of the area is very low and any soil losses will unlikely be replaced by young soil from soil formation processes. The anticipated impacts of the proposed project on the soil properties and land productivity are discussed in Section 10 below.

Following the sensitivity delineation of the project site, the allowable development limit for a permanent development footprint of approximately 150ha, was calculated. The allowable development limit for areas outside crop field boundaries were used. The results of the calculations are provided in Table 4 below.

Table 4 Estimated allowable development limits of the development footprint

Sensitivity class	Estimated area that will be affected by development footprint (ha)	Allowable limit (ha/MW)	Area allowed for a 480MW development (ha)	Area that exceeds allowable limit (ha)
Medium	25	0.35	52.5	0
Low	125	2.50	375	0

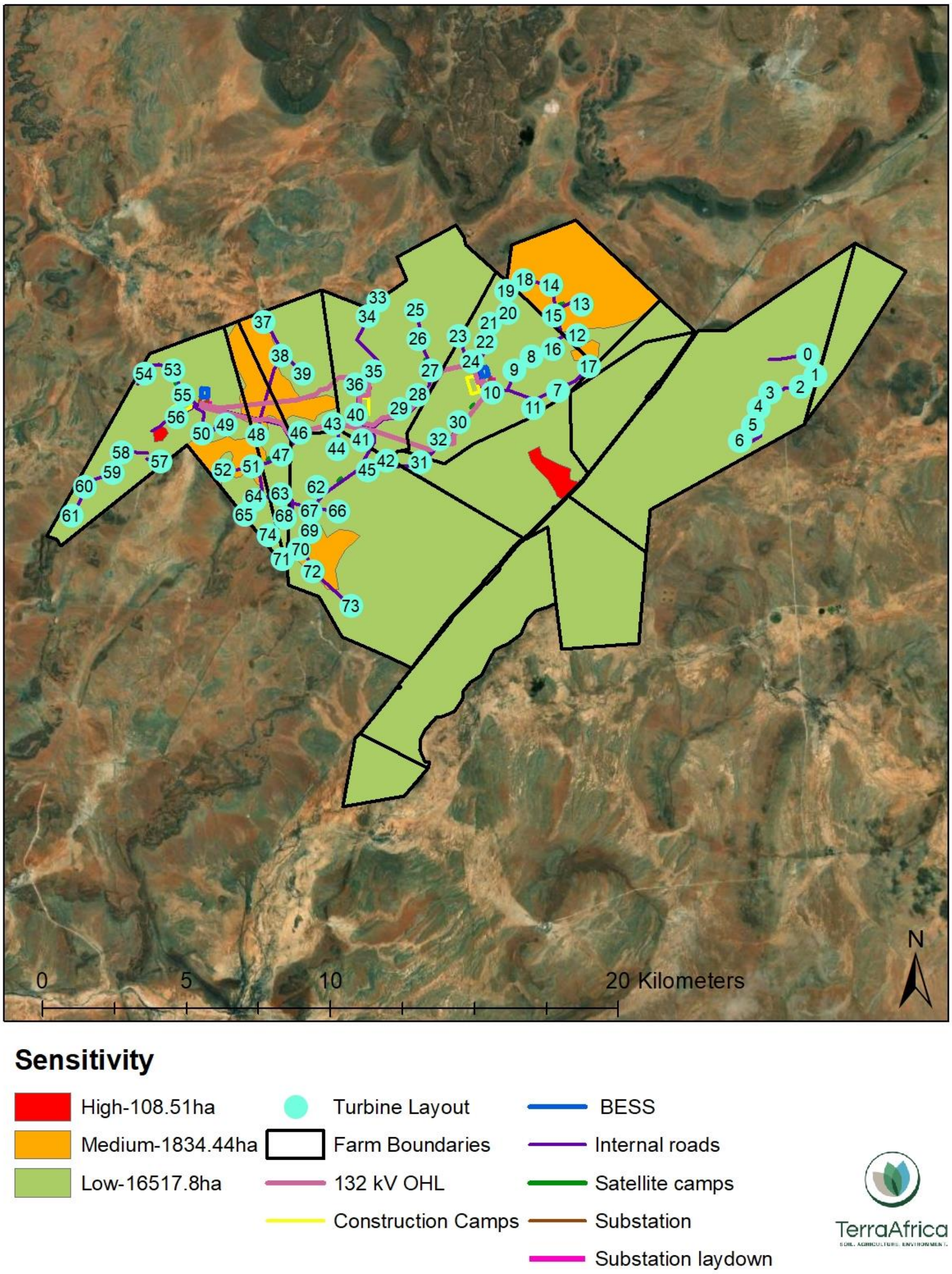

Figure 15 Layout of the Soyuz 6 infrastructure on the agricultural sensitivity of the project site.

11. Impact assessment

11.1 Impact significance rating

The proposed project site currently has limited access roads. It is anticipated that the most significant change to the soil profiles will occur during the construction phase when the main and internal access roads as well as the areas where infrastructure will be erected, will be cleared of vegetation. During the construction phase, vehicles will traverse in and out of the construction camps and fuel, oils and greases that will be used by construction equipment and vehicles, may be stored on site. Construction materials will be transported and stored on site in the temporary laydown areas. The cabling between the wind turbines will also be laid underground as far as possible.

During the operation phase, the footprint of the project will remain the same as that developed during the construction phase. Temporary construction areas will be rehabilitated. Maintenance vehicles and equipment will travel on the main and internal access roads between the turbines and the offices and workshop. It is foreseen that these soil surfaces will remain bare and will be exposed to soil erosion by wind and water movement.

The decommissioning phase will have similar impacts to that of the construction phase as special cranes and other equipment will be used to remove the wind turbine materials. Soil in the areas where the turbine structures are removed will be exposed to soil erosion and soil pollution with materials as well fuel and lubricants from the construction vehicles, are impacts associated with this phase.

Table 5 Construction phase

POTENTIAL ISSUES	SOURCE OF ISSUE	NATURE	TYPE	CONSEQUENCE OF IMPACT	EXTENT OF IMPACT	DURATION OF IMPACT	PROBABILITY OF IMPACT	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE OF IMPACT WITH MITIGATION
AGRICULTURAL SPECIALIST IMPACT ASSESSMENT													
Construction phase													
Reduction of land with natural vegetation for livestock grazing	The availability of grazing land that can be used for small stock farming will be reduced during the construction phase. It is anticipated that the impact will remain as long the infrastructure is present, and the impact will only cease once all surface infrastructure has been decommissioned and vegetation has re-established in these areas.	Negative	Direct	Slightly	Study area	Short term	Definite	Reversible	Resource will partly be lost	Achievable	**Low-**	Vegetation clearance must be restricted to infrastructure and access road areas. Materials and equipment must only be stored in the pre-determined laydown areas.	**Low -**
												Materials and equipment must only be stored in the pre-determined laydown areas.	
												Removal of obstacles to allow for access of construction vehicles must be kept to only were essential.	
												Prior arrangements must be made with the landowner and neighbouring landowners to ensure that farm and game animals are moved to areas where they cannot be injured by vehicles traversing the area.	
												No boundary fence must be opened without the landowner or neighbouring landowners' permission.	
												No open fires made by the construction teams are allowable during the construction phase.	
												The supporting infrastructure must be constructed as closely as possible together to avoid fragmentation of the entire project site.	

Soil erosion	The clearing and levelling of a limited area of land within the proposed project site will increase the risk of soil erosion in the area. It is anticipated that the risk will naturally reduce as grass and lower shrubs re-establishes in the area once the construction has been completed and the operation phase commences.	Negative	Direct	Moderate	Study area	Medium term	Possible	Reversible	Resource will partly be lost	Achievable	**Moderate-**	Land clearance must only be undertaken immediately prior to construction activities and only within the development footprint/servitude; Unnecessary land clearance must be avoided; Level any remaining soil removed from excavation pits that remained on the surface instead of allowing small stockpiles of soil to remain on the surface. Regularly monitor the site to check for areas where signs of soil erosion may start to appear. Should any soil erosion be detected, it must be addressed immediately through rehabilitation and surface stabilisation techniques Unnecessary land clearance must be avoided; Level any remaining soil removed from excavation pits that remained on the surface instead of allowing small stockpiles of soil to remain on the surface. Regularly monitor the site to check for areas where signs of soil erosion may start to appear. Should any soil erosion be detected, it must be addressed immediately through rehabilitation and surface stabilisation techniques	**Low -**
Soil pollution	The following construction activities can result in the chemical pollution of the soil: 1. Petroleum hydrocarbon (present in oil and diesel) spills by machinery and vehicles during earthworks and the removal of vegetation as part of site preparation. 2. Spills from vehicles transporting workers, equipment, and construction material to and from the construction site.	Negative	Direct	Slightly	Study area	Short term	May occur	Reversible	Resource will partly be lost	Achievable	**Low-**	Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills;	**Low -**

	3. The accidental spills from temporary chemical toilets used by construction workers.											Any waste generated during construction, must be stored in designated containers, and removed from the site by the construction teams; and	
	4. The generation of domestic waste by construction workers.											Any left-over construction materials must be removed from site.	
	5. Spills from fuel storage tanks during construction.												
	6. Pollution from concrete mixing.												
	7. Any construction material remaining within the construction area once construction is completed.												
												Any waste generated during construction, must be stored in designated containers and removed from the site by the construction teams; and	
												Any left-over construction materials must be removed from site.	
Soil compaction	The clearing and levelling of land for the wind turbines and supporting infrastructure as well as the access roads, will result in soil compaction. In the area where the access road will be constructed, topsoil will be removed and the remaining soil material will be deliberately compacted to ensure a stable road surface	Negative	Direct	Moderate	Study area	Medium term	Probable	Reversible	Resource will partly be lost	Achievable	**Moderate-**	Vehicles and equipment must travel within demarcated areas and not outside of the construction footprint;	**Low -**
												Unnecessary land clearance must be avoided;	
												Where possible, conduct the construction activities outside of the rainy season; and	
												Vehicles and equipment must park in designated parking areas.	
												Unnecessary land clearance must be avoided;	

												Where possible, conduct the construction activities outside of the rainy season; and	
												Vehicles and equipment must park in designated parking areas.	

Table 6 Operational phase

POTENTIAL ISSUES	SOURCE OF ISSUE	NATURE	TYPE	CONSEQUENCE OF IMPACT	EXTENT OF IMPACT	DURATION OF IMPACT	PROBABILITY OF IMPACT	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE OF IMPACT WITH MITIGATION
AGRICULTURAL SPECIALIST IMPACT ASSESSMENT													
Operational phase													
Soil erosion	The areas where vegetation was cleared, will remain at risk of soil erosion, especially during a rainfall event when runoff from the cleared surfaces will increase the risk of soil erosion in the areas directly surrounding the wind turbines and buildings.	Negative	Direct	Moderate	Study area	Medium term	Possible	Reversible	Resource will partly be lost	Achievable	**Moderate-**	The project site must regularly be monitored to detect early signs of soil erosion on-set. If soil erosion is detected, the area must be stabilised by the use of geo-textiles and facilitated re-vegetation.	**Low -**
Soil pollution	During the operation phase of the project, the following activities can result in the chemical pollution of the soil: 1. Petroleum hydrocarbon (present in oil and diesel) spills by maintenance machinery and vehicles. 2. The generation of domestic waste by maintenance staff.	Negative	Direct	Slightly	Study area	Short term	May occur	Reversible	Resource will partly be lost	Achievable	**Low-**	Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills; Any waste generated during construction, must be stored in designated containers and removed from the site by the construction teams; and Any left-over construction materials must be removed from site.	**Low -**

11.2 Cumulative impacts assessment and rating

In terms of the NEMA EIA Regulations (2014), a cumulative impact are defined as:

"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 the existing and reasonably foreseeable impacts eventuating from similar or diverse activities".

Project induced cumulative impacts should be considered, along with direct and indirect impacts, in order to better inform the developer's decision making and project development process. Cumulative impacts may be categorised into one or more of the following types:

- **Additive:** the simple sum of all the effects (e.g. the accumulation of ground water pollution from various developments over time leading to a decrease in the economic potential of the resource);
- **Synergistic:** effects interact to produce a total effect greater than the sum of individual effects. These effects often happen as habitats or resources approach capacity (e.g. the accumulation of water, air and land degradation over time leading to a decrease in the economic potential of an area);
- **Time crowding:** frequent, repetitive impacts on a particular resource at the same time (e.g. multiple boreholes decreasing the value of water resources);
- **Neutralizing:** where effects may counteract each other to reduce the overall effect (e.g. infilling of a wetland for road construction, and creation of new wetlands for water treatment); and,
- **Space crowding:** high spatial density of impacts on an ecosystem (e.g. rapid informal residential settlement).

Cumulative impacts are, however, difficult to accurately and confidently assess, owing to the high degree of uncertainty, as well as their often being based on assumptions. It is therefore difficult to provide as detailed an assessment of cumulative impacts as is the case for direct and indirect project induced impacts. This is usually because of the absence of specific details and information related to cumulative impacts. In these situations, the EAP will need to ensure that any assumptions made as part of the assessment are made clear. Accordingly, this includes an overview and analysis of cumulative impacts related to a variety of project actions, and does provide a significance rating for these impacts, as was done for direct project induced impacts. The objective is to identify and focus on potentially significant cumulative impacts so these may be taken into consideration in the decision-making process. It is important to realise these constraints, and to recognise that the assessment will not, and indeed cannot, be perfect. The potential for cumulative impacts will, however, be considered, rather than omitted from the decision making-process and is therefore of value to the project and the environment.

Within the proposed WEF project site and a 100 km radius around it, the following renewable energy facilities are applicable:

- Soyuz 1 WEF (DFFE Ref: 14/12/16/3/3/2/2205)
- Soyuz 2 WEF (DFFE Ref: 14/12/16/3/3/2/2206)
- Soyuz 3 WEF (DFFE Ref: 14/12/16/3/3/2/2207)
- Soyuz 4 WEF (DFFE Ref: 14/12/16/3/3/2/2208)
- Soyuz 5 WEF (DFFE Ref: 14/12/16/3/3/2/2209)
- Taaibos North WEF (DFFE Ref: TBA)
- Taaibos South WEF (DFFE Ref: TBA)
- Soutrivier Central WEF (DFFE Ref: TBA)
- Soutrivier South WEF (DFFE Ref: TBA)
- Soutrivier North WEF (DFFE Ref: TBA)
- Mainstream Victoria West Wind and Solar (DFFE Ref: 12/12/20/1788)
- Modderfontein Solar PV Facility (DFFE Ref: 14/12/16/3/3/1/917)
- Noblesfontein Wind Energy Facility (DFFE Ref: 12/12/20/1993/2) (operational)
- Ishwati Emoyeni Wind Energy Facility (DFFE Ref: 14/12/16/3/3/2/411)
- Brakpoort PV Solar PV Facility (DFFE Ref: 14/12/16/3/3/2/331)
- Nuweveld North Wind Energy Facility (DFFE Ref: 14/12/16/3/3/2/2042)
- Nuweveld West Wind Energy Facility (DFFE Ref: 14/12/16/3/3/2/2043)
- Nuweveld East Wind Energy Facility (DFFE Ref: 14/12/16/3/3/2/2044)
- De Aar Wind Energy Facility 1 (DFFE Ref: 12/12/20/2463/1)
- De Aar Wind Energy Facility 2 (DFFE Ref: 12/12/20/2463/2)

Table 7 Cumulative impact assessment of the project site

POTENTIAL ISSUES	SOURCE OF ISSUE	NATURE	TYPE	CONSEQUENCE OF IMPACT	EXTENT OF IMPACT	DURATION OF IMPACT	PROBABILITY OF IMPACT	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE OF IMPACT WITH MITIGATION
AGRICULTURAL SPECIALIST IMPACT ASSESSMENT													
Cumulative Impacts													
Soil erosion	Increase in areas susceptible to soil erosion	Negative	Cumulative	Moderate	Regional	Medium term	Probable	Reversible	Resource will partly be lost	Achievable	**Moderate-**	Each of the projects should adhere to the highest standards for soil erosion prevention and management as defined in Section 11.1 above.	**Low -**
Compaction	Increase in areas with compacted soils	Negative	Cumulative	Moderate	Regional	Medium term	Probable	Reversible	Resource will partly be lost	Achievable	**Moderate-**	Each of the projects should adhere to the highest standards for soil erosion prevention and management as defined in Section 11.1 above.	**Low -**
Soil pollution	Increase in areas susceptible to soil pollution	Negative	Cumulative	Moderate	Regional	Short term	Probable	Reversible	Resource will partly be lost	Achievable	**Moderate-**	Each of the projects should adhere to the highest standards for soil pollution prevention and management as defined in Section 11.1 above.	**Low -**

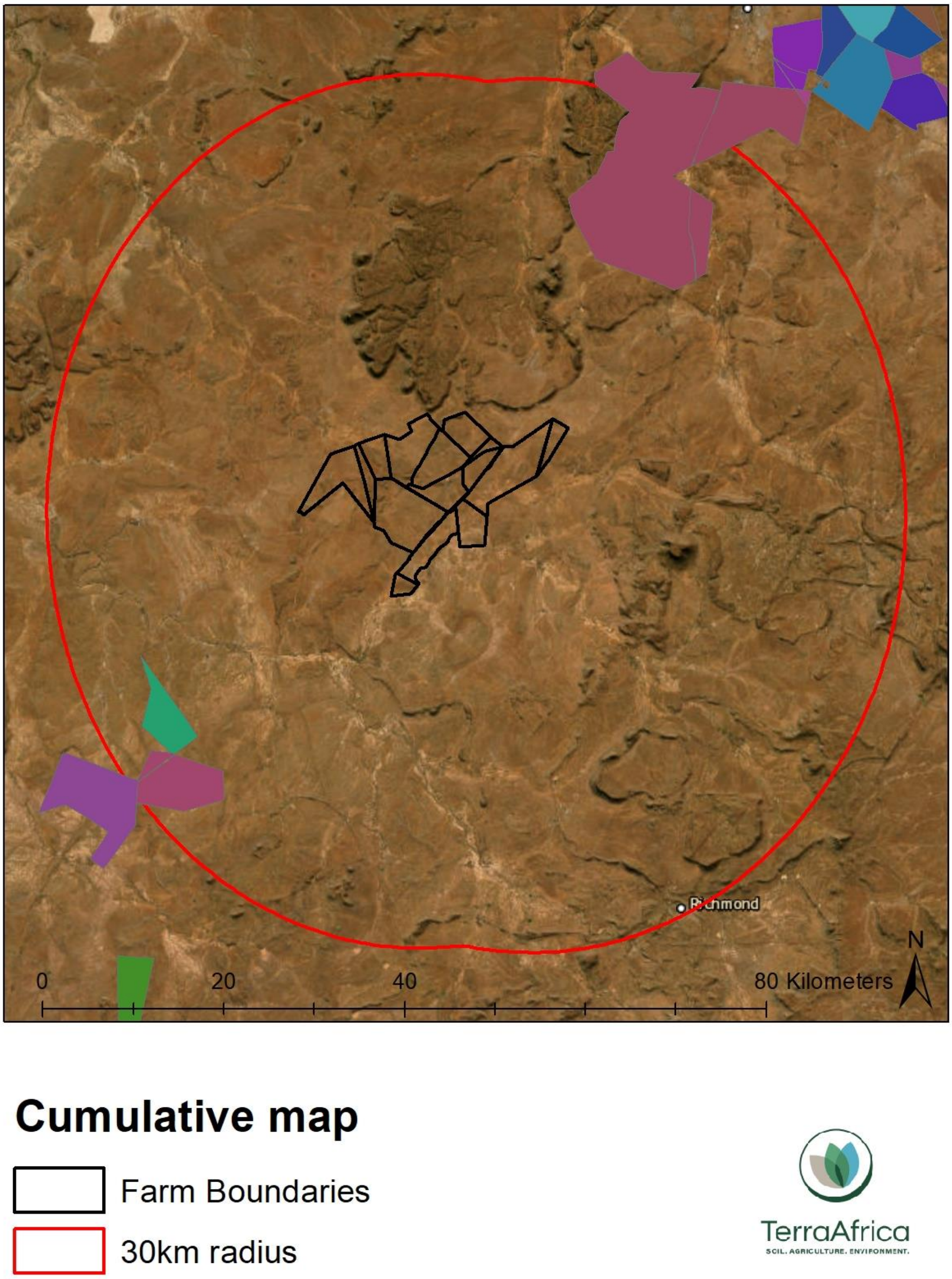

Figure 16 Locality of other renewable energy projects as per the DFFE database.

12. Acceptability statement

Following the data analysis and impact assessment above, the proposed Soyuz 6 WEF is considered an acceptable development within the project site that was assessed. The soil profiles classified within the Soyuz 6 WEF project site consist of the Mispah, Nkonkoni, Prieska, Swartland and Glenrosa soil form.

The largest part of the Soyuz 6 WEF consist almost entirely of land with Very low (Class 02) and Low (Class 05) land capability. The Mispah soil form has Very low (Class 02) land capability due to the shallow depth and presence of rocky outcrops. The Swartland, Glenrosa and Prieska soil forms has Low (Class 05) land capability. Low-Moderate (Class 07) land capability is assigned to the Nkonkoni soil form. The areas with Moderate-High (Class 09) land capability measures 108.5 ha. These areas are where the rainfed and irrigated crop fields are in the western and centre parts of the project site.

The Soyuz 6 WEF is used mainly for small livestock farming with two areas of crop fields present. These fields are located in the centre of the Remaining Extent of Portion 3 of the Farm No. 16 and along the western boundary of Portion 0 of the Farm 148. Portion 0 of the Farm includes one centre pivot irrigation area. The Soyuz 6 WEF development footprint of 150 will affect the forage of between 23 sheep (6 ha/SSU) to 30 sheep (5 ha/SSU). This impact is distributed between the different landowners of the properties of the project site.

The areas where the rainfed crop fields are located, has been delineated as land with High sensitivity. The total area with High sensitivity within the entire project site, is 108.5 ha. During the micro-siting and layout optimisation processes, all areas with High sensitivity has been avoided for the placement of infrastructure. The rest of the project site consists of Medium agricultural sensitivity (1 834 ha) and Low agricultural sensitivity (16 518 ha). Most of the infrastructure are positioned within areas with Low Sensitivity. Twelve wind turbines, and part of the 132Kv OHL fall in areas with Medium sensitivity.

It is anticipated that the construction phase will have impacts that range from medium to low and that through the consistent implementation of the recommendation mitigation measures, these impacts can all be reduced to low.

It is my professional opinion that this application be considered favourably, permitting that the mitigation measures are followed to prevent soil erosion and soil pollution and to minimise impacts on the veld quality in the areas where the infrastructure footprint will be constructed.

13. Reference list

Crop Estimates Consortium, 2019. *Field crop boundary data layer (Northern Cape 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*, Northern Cape *Province*, 2021. Pretoria.

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

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

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

APPENDIX 1 – DECLARATION OF INDEPENDENCE AND SPECIALIST DETAILS

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	**14/12/16/3/3/2/2210**
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

SOYUZ 6 WIND ENERGY FACILITY (WEF), UBUNTU LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

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

2. DECLARATION BY THE SPECIALIST

I, Mariné Pienaar, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

TerraAfrica Consult

Name of Company:

2022-10-25

Date

3. **UNDERTAKING UNDER OATH/ AFFIRMATION**

I, MARINÉ PIENAAR, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

TERRAAFRICA CONSULT CC

Name of Company

25 - 10 - 2022

Date

Signature of the Commissioner of Oaths

25/10/2022

Date

25/10/2022

Commissioner of Oaths (RSA)
Stephanus Francois Kasselman
59 Kruger street Wolmaransstad 2630
T: 018 596 1320 F: 018 596 1395

Details of Specialist, Declaration and Undertaking Under Oath

Page 3 of 3

APPENDIX 2 - CURRICULUM VITAE OF SPECIALIST

MARINÉ PIENAAR
Specialist Scientist

+2782-828-3587

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linkedin.com/in/marinepienaar

Wolmaransstad,
South Africa

EXPERTISE

Soil Quality Assessment

Soil Policy and Guidelines

Agricultural Agro-Ecosystem Assessment

Sustainable Agriculture

Data Consolidation

Land Use Planning

Soil Pollution

Hydropedology

EDUCATION

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

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

PROFESSIONAL PROFILE

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

PROJECT EXPERIENCE

Global Assessment on Soil Pollution
Food and Agricultural Organisation (FAO) of the United Nations (UN)

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

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

Data Consolidation and Amendment
Range of projects: Mining Projects, Renewal Energy

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

Project examples:

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

MARINÉ PIENAAR
Specialist Scientist

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

MARINÉ PIENAAR

Specialist Scientist

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

To verify this certificate scan this code