ENVIRONMENTAL IMPACT ASSESSMENT

PROPOSED CONSTRUCTION AND IMPLEMENTATION OF 75 MEGAWATT SUNSPOT SOLAR FACILITY ON THE FARM KORRIDOR WES NEAR ALEXANDER BAY, NORTHERN CAPE

AGRICULTURAL IMPACT REPORT
4 DECEMBER 2014

STUDY CONDUCTED AND REPORT COMPILED BY: C R LUBE
EXECUTIVE SUMMARY

Cape Environmental Assessment Practitioners (Pty) Ltd is currently conducting an EIA for Richtersveld SunSpot (SA) (Pty) Ltd, who propose to construct a 75MW (MegaWatt) CPV/PV Hybrid Plant on Portion 10 of the farm Corridor West 2, situated approximately 27 km East North East of Alexander Bay (37 km by road), in the Northern Cape.

The approach and methodology of the study was:

• To identify and describe the existing agricultural environment, mainly through a desktop study;
• To conduct a field survey to gather new information regarding agricultural conditions, the environment, climatic information and soil conditions;
• To consider possible impacts, rate their severity, propose alternatives or mitigation measures to avoid or reduce the impacts of the project on the existing agricultural environment.

The site was found unsuitable for commercial cultivation due to limiting factors such as shallow soil depth and hard setting carbonate horizons below surface. The low clay percentage results in low water holding capacity and low nutrient availability. Severe climatic conditions, such as low rainfall, further limit commercial cultivation.

The proposed project area is utilized as extensive grazing for sheep/goats, but with such low capacity that the loss of this 200ha against the larger farm area 12 217,95ha is negligible. Where possible, grazing could continue after construction and during operation in the PV-section of the plant.

A possible increase in erosion (especially wind erosion) and alternation of drainage lines (for water run-off) during construction, cause concern, but with the necessary mitigation measures recommended, the risk decreases to low.

Conclusion

The construction and operation of a CPV/PV Power Plant would have a low impact on the agricultural potential of the identified site and the local region. There are no current commercial agricultural activities in the immediate area of the site, but the existence and operation of the proposed CPV/PV Power Plant would not influence any new undertakings in this regard.
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1. **INTRODUCTION**

Cape Environmental Assessment Practitioners (Pty) Ltd is currently conducting an EIA/BA for Richtersveld SunSpot (SA) (Pty) Ltd, who propose to construct a 75MW (MegaWatt) CPV/PV Hybrid Plant (Option 1) or a CPV-only Plant (Option 2) on Portion 10 of the farm Corridor West 2, situated approximately 27 km East North East of Alexander Bay (37 km by road), in the Northern Cape.

The EIA is conducted for environmental authorisation under the National Environmental Management Act (Act 107 of 1998, as amended) and other legislation. As part of this EIA/BA, an agricultural impact assessment has been commissioned to consider the possible impacts of the project on its immediate agricultural environment.

*This document* reports on the results of the agricultural impact assessment.

2. **OBJECTIVES**

The objectives of the study were:

- To reconsider the possible impacts on agricultural production identified during the Scoping Phase
- To identify potentially significant impacts, assess them against the prescribed methodology and recommend mitigation measures where necessary.

The scope and purpose of the study are described in paragraph 3.

3. **APPROACH AND METHODOLOGY**

It should be noted that this study addresses both Options 1 and 2 of the proposed power plant.

3.1. **Desktop Study**

A desktop study was conducted to review existing data and literature sources. The desktop review provided a baseline agricultural and land use profile, focusing on the specific geographical area potentially impacted by the proposed project.

3.2. **Field Investigation**

The site was visited in November 2013 and a field survey was carried out, including a soil survey, and a study of current drainage patterns on site that may be altered during and after the construction process.

Potential impacts of the proposed project on agriculture were assessed with particular attention to the issues identified during the Scoping Phase – See paragraph 3.3.

3.3. **Assessment Criteria**

Potential impacts of the proposed project on agriculture were identified and evaluated. Particular attention was paid to the following issues:
• An area is lost for agriculture.
• Vegetation removed will have a negative impact on erosion.
• Altering of drainage patterns by construction.
• Possible impacts of service and access roads to be constructed.

3.4. Rating of Impacts
Impacts identified through the study were rated in terms of the following variables:

3.4.1. Nature of the impact
This refers to the type of effect the construction, operation and maintenance of the development would have on the environment.

3.4.2. Extent of the impact
This indicates whether the impact will be local (site area only); limited to the site and its immediate surroundings; an impact on the region or an impact on a national/international scale.

3.4.3. Duration of the impact
Duration indicates whether the lifespan of the impact would be short term (0-5 years), medium term (5-15 years), long term (16-30 years) or permanent.

3.4.4. Intensity
Intensity refers to the impact as severe or benign and is qualified as low, medium or high.

3.4.5. Probability of occurrence
This indicates the likelihood of the impact actually occurring. It is indicated as improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact will occur regardless of any prevention measures).

3.4.6. Degree of confidence in predictions
Based on the information contained in the above-described procedure, impacts are rated for their significance:

• No significance: The impacts do not influence the proposed development and/or environment in any way.
• Low significance: The impacts will have a minor influence on the proposed development and/or environment. These impacts require modification of the project design where possible, or alternative mitigation.
• Moderate significance: The impacts will have a moderate influence on the proposed development and/or environment. The impact can be ameliorated by a modification in the project design or implementation of effective mitigation measures.
• High significance: The impacts will have a major influence on the proposed development and/or environment and will result in the “no-go” option on the development or portions of the development regardless of any mitigation measures that could be implemented.
3.5. Mitigation Measures

Appropriate mitigation measures were recommended to avoid or reduce negative impacts and enhance positive impacts. These measures relate to specific actions to be implemented during construction and actions to be taken during the operational phase to address any impacts associated with the project.

4. ASSUMPTIONS AND UNCERTAINTIES

A study of this nature will inherently contain various assumptions and limitations.

As far as regional information is concerned, this is primarily a desktop-based study. Climatic conditions, land uses, land type and terrain are readily available from literature, GIS information and satellite imagery.

Notwithstanding these limitations, the site-specific field studies confirmed most of the desktop findings and I am confident that the findings provide sufficient detail for the agricultural assessment reported in this document.

5. DESCRIPTION OF THE PROPOSED PROJECT

It is proposed to construct a 75MW (MegaWatt) Concentrated Photovoltaic (CPV) and Photovoltaic Hybrid Plant, consisting of 1400 trackers spread across an area of approximately 200 ha. The power thus generated will be connected to Eskom’s national grid via a power line servitude to the Oranjemond substation.

This study investigated both the CPV facility site and the power line servitude to Oranjemond.

6. THE POTENTIALLY AFFECTED ENVIRONMENT

This section provides a general description of the immediate agricultural environment potentially affected by the construction and operation of the proposed CPV/PV Power Plant, based on a desktop study.

6.1. Locality

The proposed Power Plant will be located on Portion 10 of the farm Corridor West 2, situated approximately 27 km East North East of Alexander Bay (37 km by road), as illustrated in Figure 1.

6.2. Physical description of site

The desktop study showed that the site is situated in a very arid zone with level plains that have some relief. From the Oranjemond Substation at the Gariep River inland the initial topography is undulating with bare rocks covered with sand. The sand is transported by wind from Namibian heavy dune sands, across the river. The terrain then develops in typical flat, succulent Karoo veld, sparsely covered with vegetation.
6.2.1. Geology

The area lies in the Namibian Erathem, within the Gariep Complex, specific in the Grootderm Suite.

The lithology (mineralogical composition and texture of rocks) of this area consists of Schist Andesite and Basalt.

6.2.2. Climate

The region is classified as an arid zone with desert climate. The following specific parameters are applicable:

<table>
<thead>
<tr>
<th>Rainfall</th>
<th>0-200mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual rainfall</td>
<td>0-200mm</td>
</tr>
<tr>
<td>Summer rainfall</td>
<td>&lt;62.5mm</td>
</tr>
<tr>
<td>Winter rainfall</td>
<td>&lt;62.5mm</td>
</tr>
<tr>
<td>Variation in rainfall</td>
<td>40 to 50%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean maximum temperature</td>
<td>29-31°C</td>
</tr>
<tr>
<td>January Temperature</td>
<td>&gt;27.5°C</td>
</tr>
<tr>
<td>Mean minimum temperature</td>
<td>&lt;8°C</td>
</tr>
<tr>
<td>July temperature</td>
<td>&lt;7.5°C</td>
</tr>
<tr>
<td>Temperature range</td>
<td>&gt;15°C</td>
</tr>
<tr>
<td>First frost expected</td>
<td>No frost before June</td>
</tr>
<tr>
<td>Last frost expected</td>
<td>No frost after August</td>
</tr>
<tr>
<td>Hours of sunshine</td>
<td>&gt;80%</td>
</tr>
<tr>
<td>Evaporation</td>
<td>2200-2400mm</td>
</tr>
<tr>
<td>Humidity</td>
<td>&lt;30%</td>
</tr>
</tbody>
</table>
6.2.3. Soils

With the climate and geology associated with the area, calcic soils are prone to develop. Calcic soils originate in arid climates with the accumulation of secondary lime, forming a distinctive horizon consisting chiefly of calcite. In calcic soils, either hardpan carbonate or a soft carbonate horizon or (rarely) gypsic horizon dominates the morphology of the sub-soil. Soil forms with these characteristics include Molopo, Askham, Kimberly, Plooysburg, Etosha, Gamoep, Addo, Prieska, Brandvlei and Coega.

AGIS indicates the typical profile for soils in this region as follows:

**Area specific**
- Soils with minimal development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils.
- Lime generally present in part or most of the landscape.
- Red and yellow well drained sandy soil with high base status
- Freely drained, structure less soils
- Favourable physical properties
- May have restricted soil depth, excessive drainage, high erodibility, low natural fertility
- Strongly saline soils

**Site specific**

The desktop study further indicated that the majority of soils expected (>80%) to be found here include:

<table>
<thead>
<tr>
<th>Old Notification</th>
<th>Recent Notification</th>
</tr>
</thead>
<tbody>
<tr>
<td>FORM</td>
<td>SERIES</td>
</tr>
<tr>
<td>Mispa</td>
<td>Muden</td>
</tr>
<tr>
<td></td>
<td>Kalkbank</td>
</tr>
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<td></td>
<td></td>
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<tr>
<td>Hutton</td>
<td>Maitengwe</td>
</tr>
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</tr>
</tbody>
</table>

6.2.4. Vegetation

The region is marked by Karoo and Karroid veld types, while the vegetation biome is that of Succulent Karoo. Sweet grass and shrub veld occur, while tree density is less than 5%.

Grazing capacity is low at 61 to 100 hectares per large stock unit (LSU).

The Normalised Difference Vegetation Index (NDVI) is low. NDVI refers to a mathematical formula applied to satellite imagery to provide information on plant activity or vigour. It is an indicator of active vegetation cover.

6.2.5. Topography

The topography has low relief with terrain form 1, namely crest. The slope gradient is between 0 and 2% with a regular shape.

Higher ground drains towards multiple depressions, forming waterways towards the Gariep River. See *Figure 2*. 
7. FIELD STUDY FINDINGS

7.1. Past and Current Agricultural Activities on Site

The site is currently utilised for extensive sheep farming. There is no evidence of past or current cultivation.

7.2. Structures on site

The only structure near, but not on, site is a windmill and reservoir. See Figure 3.

---

Figure 2: Drainage patterns of proposed development area

Figure 3: Infrastructure near site
7.3. **Surrounding developments**

The only developments near the site include:

- A narrow buffer around the Gariep River, where cultivation under irrigation takes place.
- Sheep farming without internal camp fences.
- Results of open mining were observed.

![Shelter for herdsmen point 22 on site](image1)

**Shelter for herdsmen point 22 on site**

![Open mining about 7 km North-north-west of site](image2)

**Open mining about 7 km North-north-west of site**

![Cultivation some 17 km west north west of the site](image3)

**Cultivation some 17 km west north west of the site**

7.4. **Soil**

Soil was augered at a 200m interval on the north, middle and south boundaries. Soil properties were noted from samples taken with a hand auger. Table 1 shows the method and various soil properties noted at each augering point.

<table>
<thead>
<tr>
<th>Table 1: Soil properties noted – Site and Servitude</th>
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<tbody>
<tr>
<td><strong>Depth</strong></td>
</tr>
<tr>
<td>Structure</td>
</tr>
<tr>
<td>Carbon</td>
</tr>
</tbody>
</table>

7.4.1. **Site**

Auger points were plotted and soil groups were indicated - see *Figure 4.*
The soil observation forms completed at the augering points in Error! Reference source not found. are representative of the three soil forms identified on the site. These are further described in Table 3.

![Augering points diagram](image)

**Figure 4: Augering points – Site**

**Table 2: Soil Forms identified on the 200ha parcel – Site**

<table>
<thead>
<tr>
<th>OBS</th>
<th>LAT</th>
<th>LONG</th>
<th>MOISTURE</th>
<th>S-GR</th>
<th>CONS</th>
<th>STRUC</th>
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<td>SLOPE SHAPE</td>
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<tr>
<td>FAM</td>
<td>1000</td>
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<tr>
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<td>GEO</td>
<td>51</td>
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**L_COVERUSE:** Succulent Karoo grazing

<table>
<thead>
<tr>
<th>VIS.VELD.COND</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>10</th>
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**Table 3:**

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<td>TYPE</td>
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<td>COL</td>
</tr>
<tr>
<td>FAM</td>
<td>2000</td>
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<td>C</td>
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<tr>
<td>ROUGH</td>
<td>1</td>
<td>ASD</td>
<td>20</td>
<td>GEO</td>
<td>51</td>
<td>B</td>
<td>2017-5yr44</td>
</tr>
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</table>

**L_COVERUSE:** Succulent Karoo grazing

<table>
<thead>
<tr>
<th>VIS.VELD.COND</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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</table>

**VIS.VELD.COND**

**Agricultural Impact Report**

4 December 2014
Table 3: Description of soil forms – Site

<table>
<thead>
<tr>
<th>Plooysburg (60 cm)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>About 30% of the area is represented by the Plooysburg form (Family Brakkies)</td>
<td></td>
</tr>
<tr>
<td>0-20cm red sandy (Very fine grade) single grain structured top soil</td>
<td></td>
</tr>
<tr>
<td>20-40cm Red brown, loamy sand, (Very fine grade) structure less sub soil</td>
<td></td>
</tr>
<tr>
<td>Hardpan Carbonate horizon</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Kimberly (60-80 cm)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>About 10% of the area is represented by Kimberly form (Family Taung)</td>
<td></td>
</tr>
<tr>
<td>0-20cm red sandy (Very fine grade) single grain structured top soil</td>
<td></td>
</tr>
<tr>
<td>40-60cm Red brown, loamy sand, (Very fine grade) structure less sub soil</td>
<td></td>
</tr>
<tr>
<td>10cm gravel on top of Soft Carbonate horizon</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coega and Plooysburg (20-30 cm)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>About 60% consists of the Coega soil form (Family Marydale).</td>
<td></td>
</tr>
<tr>
<td>0-20cm red, sandy, (fine grade) with single grain structure top soil</td>
<td></td>
</tr>
<tr>
<td>Hard pan Carbonate horizon</td>
<td></td>
</tr>
</tbody>
</table>

The soils were then grouped in uniform utilization polygons, as illustrated in Figure 5.

Figure 5: Soil Groups – Site
7.4.2. Servitude

The servitude stretches over various soil types. This is indicated on the Land type map in Figure 6.

Figure 6: Land type map – Servitude

Figure 7: Augering points – Servitude
Soil was augered as illustrated in Figure 7. Soil properties were noted from samples taken with a hand auger. **Error! Not a valid bookmark self-reference.** Table 1 shows the soil forms found on the servitude, consisting of Kimberly (40 cm) and Coega (20 cm). Further details about these soil forms are contained in Table 3.

### Table 4: Soil Forms identified on the servitude buffer

<table>
<thead>
<tr>
<th>OBS</th>
<th>LAT</th>
<th>LONG</th>
<th>SLOPE GRAD</th>
<th>SLOPE SHAPE</th>
<th>MOISTURE</th>
<th>EROSION</th>
<th>FORM</th>
<th>ECO</th>
<th>ECOSYMB</th>
<th>TEC</th>
<th>DEPTH</th>
<th>COL</th>
<th>CLAY</th>
<th>SGR</th>
<th>CONS</th>
<th>STRUC</th>
<th>STONE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>29 33 34.3</td>
<td>10 40 45.7</td>
<td>B</td>
<td>M</td>
<td>1</td>
<td>L</td>
<td>Kimberly</td>
<td>40</td>
<td>WET</td>
<td>1</td>
<td>C</td>
<td>1</td>
<td>A</td>
<td>20.5</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Coega</td>
<td>20</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

7.5. **Veld Condition Assessment**

A veld condition assessment was done simultaneous with the soil survey, by visual acknowledgement and random sampling on 1m² grids. The outcome of the veld condition assessments is shown in Table 5 and **Error! Reference source not found.** and demonstrated by the photos in Figure 8 and Figure 9.

### Table 5: Veld Condition Assessment outcome: Site

<table>
<thead>
<tr>
<th>ASSESSMENT CATEGORY</th>
<th>FINDING</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLANT COVER</td>
<td>Plant cover very sparse with large bare areas</td>
<td>1</td>
</tr>
<tr>
<td>COMMON GRASSES</td>
<td>Mainly poor grazing grasses very scarce Karoo succulents</td>
<td>1</td>
</tr>
<tr>
<td>SURFACE CONDITION</td>
<td>Moderate levels of top soil loss</td>
<td>3</td>
</tr>
<tr>
<td>BUSH ENCROACHMENT</td>
<td>No encroachment present</td>
<td>10</td>
</tr>
<tr>
<td>SOIL TYPE</td>
<td>Sandy soil</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 8: Veld conditions – Site**

With a score of 17/80 and rainfall of only 200 mm per annum, the veld condition is classified as very poor with a grazing capacity of 110 ha/LSU.
Table 6: Veld Condition Assessment outcome: Servitude

<table>
<thead>
<tr>
<th>ASSESSMENT CATEGORY</th>
<th>FINDING</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLANT COVER</td>
<td>Plant cover very sparse with large bare areas</td>
<td>1</td>
</tr>
<tr>
<td>COMMON GRASSES</td>
<td>Mainly poor grazing grasses very scarce Karoo succulents</td>
<td>1</td>
</tr>
<tr>
<td>SURFACE CONDITION</td>
<td>Severe levels of top soil loss</td>
<td>1</td>
</tr>
<tr>
<td>BUSH ENCROACHMENT</td>
<td>No encroachment present</td>
<td>10</td>
</tr>
<tr>
<td>SOIL TYPE</td>
<td>Sandy soil</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

With a score of 16/80 and rainfall of only 200 mm per annum, the veld condition is classified as very poor with a grazing capacity of 110 ha/LSU.

It should be noted that the evaluation of veld conditions is always subjective and another valuator may find the conditions better or poorer. However, should the veld conditions be improved, the grazing capacity could only increase to 40 ha/LSU due to low rainfall, poor soil and changeable climatic conditions. Furthermore, improvement of these veld conditions could only be done by expensive effective management over decades,

7.6. Water Availability/Provision

Currently, water is provided to livestock from boreholes pumped by windmills and stored in reservoirs and troughs.

For the Power Plant, a new water pumpline from the Gariep River is intended and forms the subject of another study.

7.7. Land Capability and Suitability for agriculture

Land capability is classified as non-arable low potential grazing land. This is due to the arid climate and limiting soil properties.

The land capability and suitability for crop production is shown in Table 7 and Table 9, while capability and suitability for grazing is set out in Table 8 and Table 10.
Table 7: Land Capability and Suitability for Crop Production – Site

<table>
<thead>
<tr>
<th>Land capability class</th>
<th>Suitability Rating</th>
<th>Major Limitation to Crop Production</th>
<th>% of Local Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class VI Coega</td>
<td>Very low</td>
<td>Low water holding capacity</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shallow rooting zone</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe climate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe erosion hazard</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Saline soil restricted crop choice</td>
<td></td>
</tr>
<tr>
<td>Class IV Ploloysburg and Kimberly</td>
<td>Low</td>
<td>Low water holding capacity</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe climate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe erosion hazard</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Saline soil restricted crop choice</td>
<td></td>
</tr>
</tbody>
</table>

Table 8: Land Capability and Suitability Assessment for Grazing – Site

<table>
<thead>
<tr>
<th>Area Description</th>
<th>Suitability Rating</th>
<th>Major Limitation to Grazing</th>
<th>Area (ha)</th>
<th>% of Local Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep</td>
<td>Low</td>
<td>Very shallow rooting depth on carbonate hard setting, low clay content, low rain fall, with carrying capacity of 10–16ha/SSU</td>
<td>100ha</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 9: Land Capability and Suitability for Crop Production – Servitude

<table>
<thead>
<tr>
<th>Land capability class</th>
<th>Suitability Rating</th>
<th>Major Limitation to Crop Production</th>
<th>% of Local Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class VI Coega</td>
<td>Very low</td>
<td>Low water holding capacity</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shallow rooting zone</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe climate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe erosion hazard</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Saline soil restricted crop choice</td>
<td></td>
</tr>
<tr>
<td>Class IV Kimberly</td>
<td>Low</td>
<td>Low water holding capacity</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe climate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe erosion hazard</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Saline soil restricted crop choice</td>
<td></td>
</tr>
</tbody>
</table>

Table 10: Land Capability and Suitability Assessment for Grazing - Servitude

<table>
<thead>
<tr>
<th>Area Description</th>
<th>Suitability Rating</th>
<th>Major Limitation to Grazing</th>
<th>Area (ha)</th>
<th>% of Local Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep</td>
<td>Low</td>
<td>Very shallow rooting depth on carbonate hard setting, low clay content, low rain fall, with carrying capacity of 10–16ha/SSU</td>
<td>100ha</td>
<td>100</td>
</tr>
</tbody>
</table>

7.8. Summary of findings – Site and Servitude

The site and servitude are unsuitable for cultivation due to the following limiting factors:

- Low annual rainfall, high evaporation and extreme temperatures restrict dry land cultivation.
- The very shallow soil depth (60% of area) with its limited water holding capacity restricts root development.
- Low clay percentage results in low water holding capacity and low nutrient availability, resulting in low soil fertility.
Saline soil restricts productivity and choice of crops

The establishment of a Power Plant and conveying power to the substation would have a low impact on the agricultural potential or activities at the identified sites or in the surrounding area.

8. POSSIBLE IMPACTS

Notwithstanding the findings stipulated in paragraph 7.8 above, there are a few possible impacts on commercial agriculture in general and on soil conservation specifically that needed further attention.

With the development of the solar farm, the current physical characteristics change:

- An area is lost for agriculture.
- Vegetation removed will have a negative impact on erosion.
- Structures with concrete foundations and floors will be erected.
- Drainage will be altered.
- Transmission lines with service roads will be constructed.
- A water pipeline will be installed.

**NB:** The possible impacts and mitigation measures apply to all phases of the Solar Facility, i.e. Construction, Operation and Decommissioning.

8.1. Potential loss of agricultural land

Measured against the current stocking rate of 10 to 16 ha/SSU grazing for 20 sheep/goats will be lost.

The harsh climate conditions and low availability of water limit agricultural practices to nomadic herding of sheep. Because of the lack of internal fences, the effect of the 200 ha will be distributed over the 12 217.95 ha of the farm as a whole.

With the merging and rehabilitation of current access roads into one upgraded road, at least 20 ha could be regained for grazing.

The loss of 200 ha under these circumstances is therefore low for agricultural purposes.

8.2. Potential for erosion and loss of topsoil

The very fine sand grade of top soil influences the stability and increases erodibility potential.

8.2.1. Water erosion

The factors playing a role in erosion are illustrated by the following diagram:
A: Erosivity

Erosivity refers to the ability of rain to cause erosion and is a function of the physical characteristics of rainfall, namely the quantity, intensity and energy of predicted storms.

Erosivity is divided into eight groups with 100mm increments. The erosivity index for this site is low and rated zero to 100 mm

B: Erodibility

Erodibility refers to the resistance of the soil against erosion. This is a function of physical and management characteristics. The physical characteristics of the site include:

- Soil consist of excessively drained sands with high infiltration rates and low runoff potential
- Catchment area is characterised by a low relief, i.e. flat land with average slopes of 0 to 5%. The catchment area is also small, because water drain naturally away from the site.
- Soil infiltration is high.
- Vegetation cover is poor - less than 10% of the drainage area is under good cover.
- Surface storage is poor - surface depressions are few and shallow.

C: Management of land

Currently, extensive grazing with sheep /goats is the only farming that takes place. Shepherds control the grazing by moving in a nomadic way with the sheep. The veldt condition is poor and no management is done.

D: Management of crop

No crops are cultivated.

The possibility of water erosion is low, due to the low annual rainfall, high infiltration rate of soil and very flat relief.
8.2.2. Wind erosion

The risk of erosion caused by wind is high, due to aridity of the climate, high evaporation and structure less sandy soil with poor basal cover.

The development site is currently subject to wind erosion as can be seen on the photos in Figure 10 below:

![Existing wind erosion](image)

Figure 10: Existing wind erosion

8.3. Possible impacts on soil conservation due to change of surface drainage

According to designs, the cabling trenches of the proposed Solar Facility will fit in with the concept of water runoff control – see Figure 11.

![Change in direction of drainage](image)

Figure 11: Change in direction of drainage
The change in direction of drainage will be beneficial because the ridges and structures will be placed on the natural contour line, perpendicular to the flow line. This will act as a drain, slowing down the speed of water as well as wind. Thus, the runoff water is kept in its natural catchment area.

It is possible that the Power Plant may have a positive impact on the site, in that current access roads will be upgraded and properly maintained, minimizing the current practice of adding new roads whenever old ones get degraded. This practice increases the risks of wind erosion. See Photo A in Figure 12, which shows the existing road and Photo B for an example of a properly constructed and maintained dirt road.

![Photo A](image1.jpg)  ![Photo B](image2.jpg)

**Figure 12: Existing and futuristic roads**

The traject for the transmission lines is planned to cross low potential soil and vegetation (see Error! Reference source not found.). After construction, little activity will occur under them. The land underneath will still be accessible to grazing animals, should it be allowed during operation.

![Figure 13: Basal cover on the transmission traject](image3.jpg)

The structure will have low impact on the natural resources.
9. **MITIGATION MEASURES**

Vegetation increase soil cohesion and reduce wind speed at ground level. If it is removed, the risk of wind erosion increase, especially with sandy textured and dry soil. As it is important to clear the land for construction of the facility, measures must be put in place to minimise the risk of erosion.

Measures to combat wind erosion include the following:

- Establish a rough surface left by cloddy tillage or ridges perpendicular to the prevailing wind to slow down the wind speed at ground level (ridges must not be higher than 40cm).
- Increase plant cover: Vegetation stubble and crop residues in soil cut wind speed at ground level.
- Soil moisture increases cohesion of sand and loam, temporarily preventing their erosion by wind.
- Windbreaks may be erected.

Alternative for stripping by grader, a tine implement could be used instead, which leave the top soil with a rough effect and not loosing topsoil. Instead of digging cable trenches with back actor, a ripper, modified to a mole plough could be used to prevent loss of topsoil - see Figure 14.

![Tine implement](image1)

![Ripper](image2)

*Figure 14: Tine implements for clearing*

The photos in Figure 15 from a completed solar facility show measures to combat wind erosion.
The trenches excavated for connecting cables form structures to prevent wind erosion during the construction phase. The ridge formed by the excavated soil form a diversion to slow down the wind speed. With the ridge perpendicular on the natural contour, runoff water is diverted towards the natural drainage line as control measure against water erosion.

When completed the panels can act as windbreaks slowing down wind speed.

Vegetation propagated on trench lines start growing. Surface structures removed leaving propagated trenches with permanent vegetation.

The top soil is piled up in the assembling area. The sub-soil is distributed as a ridge alongside the trench.

The water control structures convey storm water.

The hard carbonate serve as the "rough surface and ridge" to slow down wind speed at ground level.

*Figure 15: Demonstration how the impact of the can be positively used against wind erosion*
10. EVALUATION OF IMPACTS

The evaluation of possible impacts during construction, operation and decommissioning without mitigation and with mitigation measures implemented in set out in Table 11.

Table 11: Summary of Impact Ratings – Pre and post mitigation

<table>
<thead>
<tr>
<th>Nature of impact</th>
<th>Potential loss of agricultural land</th>
<th>Potential for erosion and loss of topsoil</th>
<th>Possible impacts on soil conservation due to change of surface drainage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent of impact</td>
<td>Site only</td>
<td>Site and immediate surroundings</td>
<td>Site only</td>
</tr>
<tr>
<td>Duration of impact</td>
<td>Short term</td>
<td>Short term</td>
<td>Long term</td>
</tr>
<tr>
<td>Intensity</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Probability of occurrence</td>
<td>Definite</td>
<td>High</td>
<td>Definite</td>
</tr>
<tr>
<td>Level of significance</td>
<td>Low</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Significance after mitigation</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

11. CONCLUSION

The findings of this study indicate that impacts on agriculture, locally and on site, will be minimal and will have no influence on commercial farming. Due to poor soil properties and extreme climatic conditions, farming activities consist of extensive grazing for sheep/goats, but due to the low grazing potential of the region, the loss of the small area of grazing land is negligible.

It is possible that the Power Plant may have a positive impact on the site, in that current access roads will be upgraded and properly maintained, minimizing the current practice of adding new roads whenever old ones get degraded.

Furthermore, the cover provided by the sun panels may reduce the wind impact.

C R LUBBE
AGRICULTURAL SPECIALIST

4 December 2014
LIMITATIONS

This Document has been provided subject to the following limitations:

(i) This Document has been prepared for the particular purpose outlined in the proposal and no responsibility is accepted for the use of this Document in other contexts or for any other purpose.

(ii) CR Lubbe did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document.

(iii) Conditions may exist which were undetectable given the limited nature of the enquiry CR Lubbe was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.

(iv) It is recognised that the passage of time affects the information and assessment provided in this Document. CR Lubbe’s opinions are based upon information that existed at the time of the production of the Document. CR Lubbe’s opinion rests on the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site.

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REFERENCES


Environment Practitioner Curriculum Vitae

Christiaan Rudolf Lubbe

KEY QUALIFICATIONS:
National Higher Diploma in Agriculture (Irrigation), Technikon Pretoria, 1982
Certificate in Stereoscopic Interpretation, Geology and Resource Classification and Utilisation, Department of Agriculture, 1979
National Diploma in Agriculture, Technikon Pretoria, 1976

OTHER EDUCATION:
Certificate in Landscape Management, Technikon Pretoria, 1988
Cultivated pastures (Mod 320), University of Pretoria, 1995
FSC Auditors Course (Woodmark, UK), Sappi Ltd, 2003
NOSA Health and Safety Certificate, 1996
Certificate of Competence: Civil Designer - Design Centre and Survey and Design (Knowledge Base, August 2005)

EMPLOYMENT RECORD:
July 2006 to date CR LUBBE Self employed Involved in various projects (see project related experience).
Jan 1997 – May 2004 CR LUBBE Pretoria, SA Self employed Involved in various projects (See Project related experience below)
1980 to 1996 Technikon Pretoria Pretoria, SA Lecturer Teaching Agricultural Engineering and Land Use Planning subjects. Teaching included practical courses, examination and moderation
1974 - 1979 Department of Agriculture (Transvaal Region) Carolina and Ermelo, SA Senior Extension Technician Farm Planning, Surveying, Design of soil conservation systems, Agricultural Extension.

SUMMARY OF EXPERIENCE
Has 40 years of experience in planning and managing natural resources to ensure optimal utilisation, without exploiting such resources to the detriment of future generations.
Fourteen years experience as a soil consultant, doing mainly soil surveys, terrain classification and agricultural potential studies. Reports include a variety of maps and GIS aspects thus play a large role in these surveys and studies.
Seventeen years of lecturing agricultural engineering subjects: Soil Conservation Techniques I, II and III, which dealt with the surveying, design and drawing of soil conservation structures; Farm Planning, which dealt with optimal resource utilization and Agricultural Mechanization, which dealt with the implements and machinery used to mechanize farming.
Ten years experience in the survey, design and supervising the construction of soil conservation structures in the agricultural field, mainly for farm planning.

PROJECT RELATED EXPERIENCE
PROJECTS UNDERTAKEN IN INDIVIDUAL CAPACITY
Cape EA Jul 2013 Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station at Upington in the Northern Cape.
Africa Livestock Project Development Consortium  Aug 2012
Agricultural Impact Assessment for the Construction and Operation of a Beef Cattle Handlings Facility for a Sugar Company in Northern Sudan

Van Zyl Environmental Consultants  Mar 2012
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station in the Northern Cape.

Bushveld Eco Services  Nov 2011
Design and cost estimate of a stock watering system in the Lephalale district.

WSM Leshika  Sep 2011
Soil suitability survey for two new upcoming farmers at Vhuawela & Tshoga in the Limpopo Province.

National Department of Agriculture  Aug 2011
Soil survey investigating soil potential for change of land use at the Levendal Development in the Paarl district, Western Cape.

Van Zyl Environmental Consultants  Mar 2011
Agricultural Impact Assessment : EIA for the Construction and Operation of four Photovoltaic Power Stations in the Northern Cape.

WSM Leshika  Nov 2010
Potential assessments and land use plans for four new upcoming farmers in the Limpopo Province.

FP Botha  Apr 2010
Potential assessments and land use plans for various new Limpopo agricultural development hubs

Golder Associates Africa (Pty) Ltd  May 2009 – Apr 2010
Potential assessments and Landuse plans for the resettlement of land tenants at Mafube Coal Mine in the Belfast district of the Mpumalanga Province

Sappi  Vryheid, RSA
Undertook reconnaissance soil surveys on various plantations and farms in the Vryheid and Piet Retief districts to establish forestation potential and evaluation for species choice (covering a total area of 5173 ha).

Environmentek, CSIR  Nelspruit, RSA
Undertook soil and terrain classification surveys on the Jessievale (8313 ha) and New Agatha (1 700 ha) plantations.

Safcol (Komatieland)  Limpopo Province
Undertook environmental, soil and terrain classification surveys on the Thatevondo (4 500 ha), Mafela (920 ha) and Mmamatola (1 263 ha) plantations.

Measured Farming  Gabon, Swaziland & RSA
Undertook soil and terrain classification surveys on Ranch Lope and Ranch Suba in Gabon, Kubuta Farm in Swaziland and on the farms Madikwe in the Limpopo Province and Stoffelsrus in the Free State, South Africa.

Loxton Venn and Associates  Potgietersrus, RSA
Assess comparative soils and area for relocating Village Ga-Sekhaolelo on Overysel 815LR to Rooibokfontein 812LR and Village Ga-Puka on Swartfontein 818 LR to Armoed on Potgietersrus Platinum Mine.

Department of Water Affairs and Forestry  Gauteng
GPS survey and alien identification for mapping of Jukskei and Swartspruit areas, as part of the Working for Water Program.

Sustainable Forestry Management Ltd  Limpopo and Mpumalanga
Participated in a due diligence audit on various SAFCOL plantations in the Limpopo and Mpumalanga Provinces as part of the preparation of a British company’s tender to purchase these plantations.

Mustek Engineering  Ghana
Survey to provide a detailed inventory of the forest resources in 17 specified Forest Reserves in Ghana to develop a practical and operationally sound methodology for monitoring the natural forest resources in Ghana, based on satellite imagery for the Ghana Forestry Commission.

Afrigis Environmental Solutions, Pretoria  Various Soil Surveys and Landuse Plannings – Domestic and Neighbouring Countries

Rural Integrated Engineering, Pretoria  Various Soil Surveys and Landuse Plannings

Africa Land-Use Training, Modimole  Lectures at Basic Farm Planning Course (Limpopo and Gauteng)
Declaration of Independence

CR Lubbe was appointed by Richtersveld SunSpot (SA) (Pty) Ltd via Cape Environmental Assessment Practitioners (Pty) Ltd, the EAP, to conduct an independent agricultural impact assessment for the proposed PV Power Station in the Northern Cape.

He is not a subsidiary or in any way affiliated to Richtersveld SunSpot (SA) (Pty) Ltd. CR Lubbe also does not have any interest in secondary developments that may arise from the authorisation of the proposed project.

CR Lubbe

4 December 2014