# ASSESSMENT REPORT

On contract research for

***SAVANNAH ENVIRONMENTAL***

# Environmental Investigation for the proposed Noupoort CSP Project, Northern Cape

# Soils and Agricultural Potential

By

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## DECLARATION

I hereby declare that I am qualified to compile this report as a registered Natural Scientist and that I am independent of any of the parties involved and that I have compiled an impartial report, based solely on all the information available.

***D G Paterson***

January 2016

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## 1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by Savannah Environmental (Pty) Ltd to undertake a soil investigation near Noupoort, in the south-east of the Northern Cape Province. The purpose of the investigation is to contribute to the scoping phase of the Environmental Impact assessment (EIA) process for a proposed CSP solar project, including the grid connection. However, this scoping study clearly indicated that it should not be necessary to carry out any detailed field investigation as part of the EIA phase of the project.

***Scoping Report***

The scoping report must include:

» a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project

» a description and evaluation of environmental issues and potential impacts (including direct, indirect and cumulative impacts) that have been identified

» Direct, indirect and cumulative impacts of the identified issues must be evaluated within the Scoping Report in terms of the following criteria:

- ☐ the nature, which shall include a description of what causes the effect, what will be affected and how it will be affected;
- ☐ the extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international

» a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts

» identification of potentially significant impacts to be assessed within the EIA phase and details of the methodology to be adopted in assessing these impacts.

***Legislation***

In terms of the Subdivision of Agricultural Land Act (Act 70 of 1970), any application for change of land use must be approved by the Minister of Agriculture, while under the Conservation of Agricultural Resources Act (Act 43 of 1983) no degradation of natural land is permitted.

The following section summarises South African Environmental Legislation with regard to handling of topsoil to be considered for similar projects:

- The law on **Conservation of Agricultural Resources Act** (Act 43 of 1983) states that the degradation of the agricultural potential of soil is illegal.

- The **Bill of Rights** states that environmental rights exist primarily to ensure good health and well-being, and secondarily to protect the environment through reasonable legislation, ensuring the prevention of the degradation of resources.

- The Environmental right is furthered in the **National Environmental Management Act** (No. 107 of 1998), which prescribes three principals, namely the precautionary principle, the "polluter pays" principle and the preventive principle.

- It is stated in the above-mentioned act that the individual/group responsible for the degradation/pollution of natural resources is required to rehabilitate the polluted source.

- Soils and land capability are protected under the **National Environmental Management Act** 107 of 1998, the Environmental Conservation Act 73 of 1989, the Mineral and Petroleum Resources Development Act 28 of 2002 and the Conservation of Agricultural Resources Act 43 of 1983.

- The **National Veld and Forest Fire Bill** of 10 July 1998 and the **Fertiliser, Farm Feeds, Agricultural Remedies and Stock Remedies Act** 36 of 1947 can also be applicable in some cases.

- The **National Environmental Management Act** 107 of 1998 requires that pollution and degradation of the environment be avoided, or, where they cannot be avoided, minimized and remedied.

- The **Conservation of Agriculture Resources Act** (Act 43 of 1983) requires the protection of land against soil erosion and the prevention of water logging and salinization 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.

The objectives of the study are;

- To obtain all existing soil information and to produce a soil map of the specified area as well as

- To assess broad agricultural potential.

## 2. SITE CHARACTERISTICS

### 2.1 Location

The broad study area is located approximately 4 km north west of the town of Noupoort, in the Northern Cape Province (see Figure 1 below). The study area (outlined in black) consists of Portion 1 and Portion 4 of the Farm Carolus Poort 167 and the Remaining extent of Farm 207. The area lies between 31° 06' and 31° 11' S and between 24° 50' and 24° 57' E.

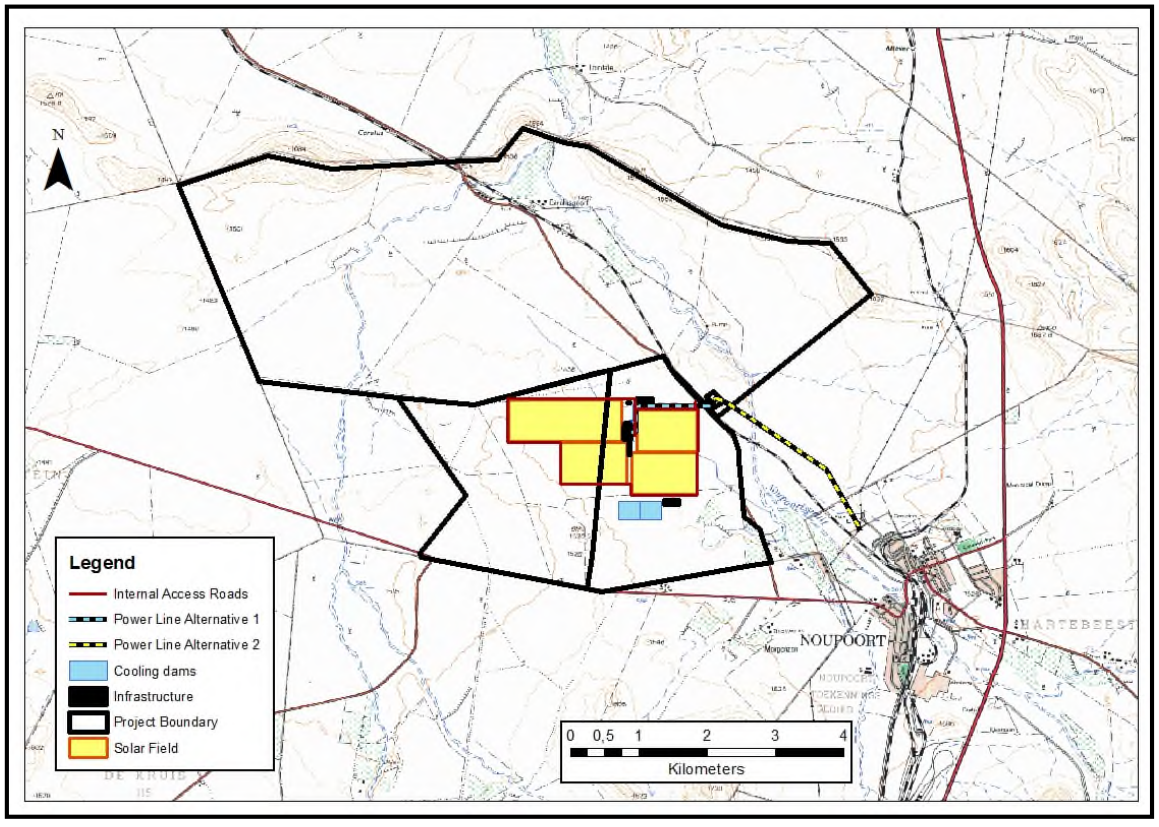


**Figure 1** Locality map

## 2.2 Terrain

The area is generally flat to gently undulating and lies at a height of approximately 1 480-1 520 metres above sea level, sloping towards the Noupoortspruit to the north-east. However, some steeper slopes occur along the rocky ridge along the northern boundary.

## 2.3 Climate

The climate of the study area (Koch, 2012) can be regarded as warm to hot with occasional rain in summer and cold, dry winters. The long-term average annual rainfall in this region of the Northern Cape is only 340 mm, with a year-round distribution, but a peak in the summer months. Rainfall is erratic, both locally and seasonally and therefore cannot be relied on for agricultural practices. The average evaporation is 2 183 mm per year, peaking at 9.9 mm per day in December.

Temperatures vary from an average monthly maximum and minimum of 32.0ºC and 15.4ºC for January to 15.9ºC and -0.5ºC for July respectively. The extreme high temperature that has been recorded is 39ºC and the extreme low –7.2ºC. Frost occurs most years on 40 days on average between mid-May and early September.

## 2.4 Parent Material

The geology of the area (Figure 2) comprises parent material from the Karoo Sequence (Geological Survey, 1988). Most of the area is underlain by mudstone of the Adelaide and Estcourt Formations, with a zone in the middle of the area on dolerite and a very small area in the south on mudstone of the Tarkastad Formation.

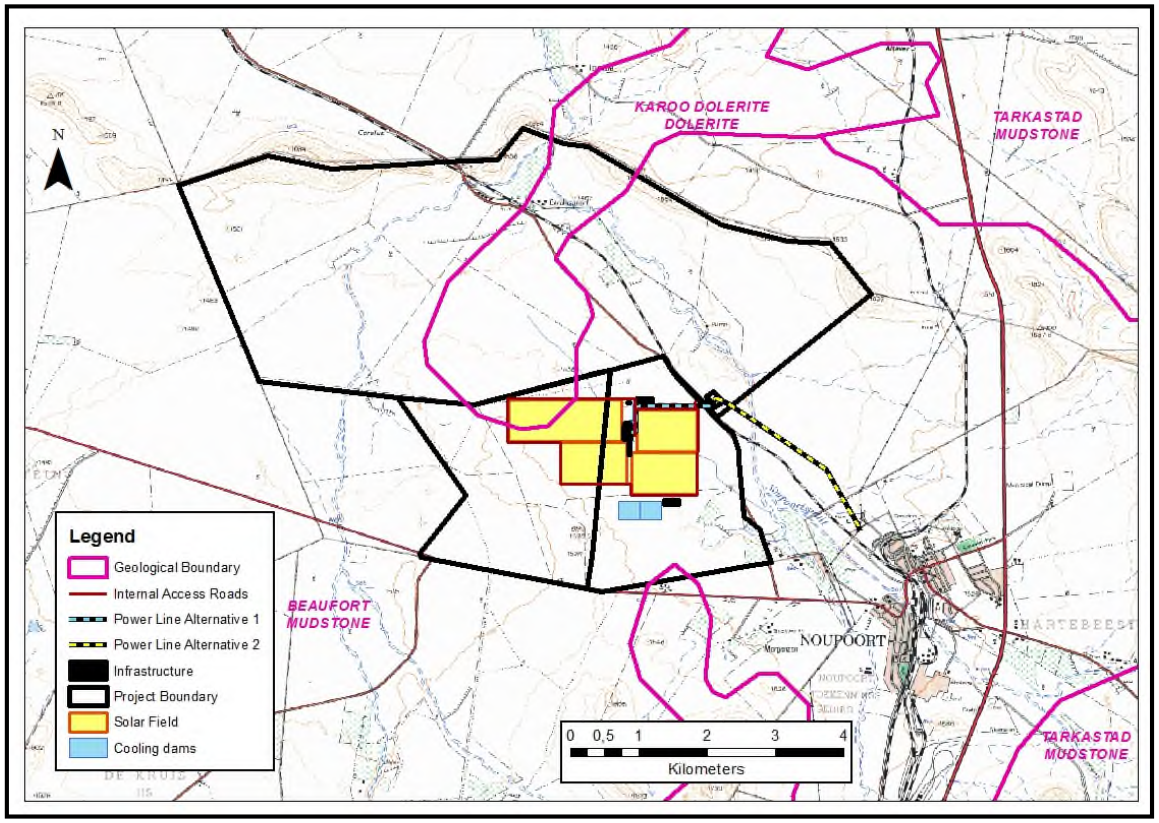


**Figure 2** Geological units in project site

## 3. METHODOLOGY

Existing information was obtained from the map sheet 3124 Middelburg (Geers & Eloff, 1992) from the national Land Type Survey, published at a scale of 1:250 000. A land type is defined as an area with a uniform terrain type, macroclimate and broad soil pattern. The soils are classified according to MacVicar *et al* (1977).

The broad study area is covered by four land types, as shown on the map in the Appendix, namely:

- **Da14, Da26, Da77** (Red, duplex soils (sandy topsoil over structured, clayey subsoil)
- **Ib316** (rocky area with shallow soils)

It should be clearly noted that, since the information contained in the land type survey is of a reconnaissance nature, only the general dominance of the soils in the landscape can be given, and not the actual areas of occurrence within a specific land type. Also, other soils that were not identified due to the scale of the survey may

also occur. **The site was not visited during the course of this study, and so the detailed composition of the specific land types has not been ground-truthed.**

A summary of the dominant soil characteristics of each land type is given in Table 1 below.

The distribution of soils with high, medium and low agricultural potential within each land type is also given, with the dominant class shown in **bold type**.

## 4. SOILS

A summary of the dominant soil characteristics is given in **Table 1** below.

**Table 1** Land types occurring (with soils in order of dominance)

| Land Type | Depth (mm) | Dominant soils | Percent of land type | Characteristics | Agric. Potential (%) |
|---|---|---|---|---|---|
| **Da14** | 450-1000 | Swartland 10/11/21 | 44% | Red-brown, sandy loam topsoil on red-brown, sandy clay loam to clay loam, structured subsoil, sometimes calcareous | High: 3.0<br>**Mod: 84.0** |
| | 450-1000 | Swartland 31/41 | 18% | Brown, sandy loam topsoil on brown, clay loam, structured subsoil, sometimes calcareous | Low: 13.0 |
| **Da26** | 450-1000 | Swartland 10/11/21 | 58% | Red-brown, sandy loam topsoil on red-brown, sandy clay loam to clay loam, structured subsoil, sometimes calcareous | High: 0.0<br>**Mod: 62.6** |
| | 50-200 | Mispah/Glenrosa | 17% | Brown, sandy loam to sandy clay loam topsoil on hard to weathering rock | Low: 27.4 |
| **Da77** | 450-1200 | Swartland 21/31 + Valsrivier 21/41 | 28% | Red-brown, sandy loam topsoil on red and brown, sandy clay loam to clay loam, structured subsoil, usually calcareous | High: 6.9<br>**Mod: 51.6** |
| | 450-1000 | Swartland 10/11 | 18% | Red-brown, sandy loam topsoil on brown, clay loam, structured subsoil, non-calcareous | Low: 41.5 |
| **Ib316** | - | Rock | 62% | Exposed rock outcrops | High: 0.0 |
| | 50-100 | Mispah 10 | 18% | Brown, sandy loam to sandy clay loam topsoil on hard rock | **Mod: 10.8**<br>Low: 89.2 |

***Note:*** Agricultural Potential, as shown in the right-hand column, refers to ***soil characteristics only*** and no climatic or other restrictions are taken into account.

## 5. AGRICULTURAL POTENTIAL

Much of the area comprises red to reddish-brown, duplex soils of the Swartland and Valsrivier forms (Table 1). The main characteristic of these soils are that the topsoil is relatively sandy and abruptly overlies a structured, clayey, often calcareous subsoil horizon. These soils are very susceptible to erosion when the topsoil horizon becomes exposed, either by agricultural activity or overgrazing by livestock. As a consequence, the agricultural potential is low, and there is a strong requirement for continuous management measures if these soils are to be utilised. In the Remote Sensing image of the study area (Figure 3), where the study area is shown by the black outline, areas of apparent erosion, shown as lighter patches on the image, are evident.

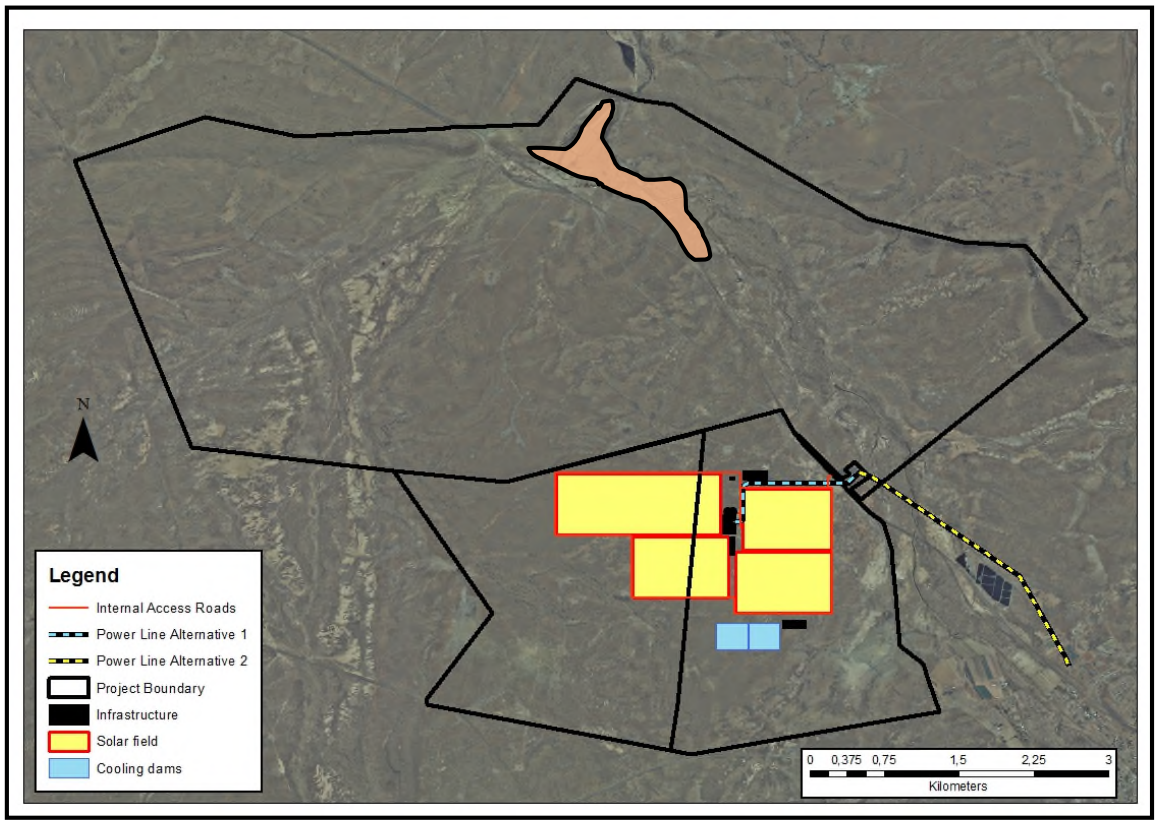


**Figure 3** Remote Sensing image of study area

In addition, the very low rainfall in the area (Section 2.3) means that the only means of cultivation would be by irrigation and the image shows virtually no signs of any agricultural infrastructure and certainly none of irrigation, except for some small cultivated lands that can be seen in the north-east of the study area, close to the Noupoortspruit. This area is shown in orange in Figure 3. The project site is currently utilized for sheep and game farming.

## 6. IMPACTS

The first major impact on the natural resources of the study area would be the loss of arable land due to the construction of the various types of infrastructure. However, this impact would in all probability be of limited significance and would be local in extent. At the end of the project life, it is anticipated that removal of the structures would enable the land to be returned to more or less a natural state following rehabilitation, with little impact, especially given the low prevailing agricultural potential.

The impact can be summarized as follows:

**Table 3a** Impact significance

| **Nature** of impact: Loss of agricultural land<br>Land that is no longer able to be utilized due to construction of infrastructure. Although likely to occur at the extent of the development footprint, this impact is expected to be of low significance as a result of the limited agricultural potential of the site. | | |
|---|---|---|
| | Without mitigation | With mitigation |
| **Extent** of impact | Site only (1) | Site only (1) |
| **Duration** of impact | Long-term (4) | Long-term (4) |
| **Magnitude** of impact | Minor (2) | Minor (2) |
| **Probability** of impact | Highly probable (4) | Probable (3) |
| **Significance** of impact | **Low (28)** | **Low (21)** |
| **Status (positive or negative)** | Negative | Negative |
| **Reversibility** | Reversible | |
| **Irreplaceable loss of resources** | No | |
| **Can impacts be mitigated** | Yes | |
| **Mitigation** factors | The main mitigation would be to ensure that as little surface disturbance as possible occurs. In addition, avoid any cultivated areas along the Noupoortspruit. | |
| **Residual Impacts:** | If infrastructure is remained at the end of the project life, rehabilitation to an acceptable degree of agricultural production (probably grazing potential) should be possible. | |

Considering that the broad soil types occurring on and surrounding the site are homogeneous, coupled with the fact that there is limited potential for agricultural activity within the project site, no site visit was required. It can confidentially be stated that the impact on agricultural potential will be low. The study undertaken by the Agricultural Research Council (ARC-ISCW) confirmed that the overall impacts of the proposed facility on agriculture and soil conditions will be of low significance,

predominantly because of the climatic conditions and the low agricultural potential of the site. The possibility to house substantial commercial farming practices (agriculture or grazing) on the property is not realistic, because of the dominant climatic conditions and prevailing soil conditions. Irregular rainfall, along with other soil-related factors, leads to low agricultural potential.

**Table 3b** Impact significance

| **Nature of impact:** Increased susceptibility to water erosion<br>Loss of soil resources as a result of erosion during all phases of the project. Most of the project site comprises duplex soils. These soils are very susceptible to erosion, especially water erosion when the topsoil is disturbed. | | |
|---|---|---|
| | Without Mitigation | With Mitigation |
| **Extent** of impact | Site only(1) | Site only(1) |
| **Duration** of impact | Long-term (4) | Long-term (4) |
| **Magnitude** of impact | Low (4) | Minor (2) |
| **Probability** of impact | Highly probable (4) | Probable (3) |
| **Significance** of impact | **Medium (36)** | **Low (21)** |
| **Status (positive or negative)** | Negative | Negative |
| **Reversibility** | Irreversible | |
| **Irreplaceable loss of resources** | No | |
| **Can impacts be mitigated?** | Yes | |
| **Mitigation** factors | The main mitigation would be to ensure that as little surface disturbance as possible occurs. Where vegetation is removed for construction, specific measures would need to be put in place during both the construction and operational phases, which would include: absolute minimum removal of vegetation; soil conservation measures; re-vegetation as soon as possible; regular monitoring of erosion situation. | |
| **Residual Impacts** | Loss of topsoil through erosion can occur unless appropriate mitigation is implemented. Loss of soil resource is irreversible. | |

Erosion is a common occurrence on construction sites where soil is loosened and vegetation cover is stripped. The nature of the development should only include the partial clearance of vegetation within the development footprint. Vegetation should be permitted to remain underneath the trough system, and should be maintained throughout the operation phase. Due to the predominance of duplex soils, as mentioned above, the hazard of ***water erosion*** when the topsoil is disturbed may be significant, as these areas are mapped as "highly susceptible" (ARC-ISCW, 2004).

Both power line alternatives are underlain by red to reddish-brown, duplex soils of the Swartland and Valsrivier forms. The agricultural potential is low, and there is a strong requirement for continuous management measures if these soils are to be utilised. After the consideration of the power line alternatives, it is concluded that both proposed power line routes are acceptable and appropriate from an agricultural perspective and can all be considered as feasible options.

**Table 3c** Impact significance

| **Nature** of impact: Cumulative impact of the loss of agricultural land<br>Land that is no longer able to be utilised due to due to construction of infrastructure | | |
|---|---|---|
| | Overall impact of the proposed project considered in isolation | Cumulative impact of the project and other projects in the area |
| **Extent** of impact | Site only (1) | Site only (1) |
| **Duration** of impact | Long-term (4) | Long-term (4) |
| **Probability** of impact | Probable (3) | probable (3) |
| **Magnitude** of impact | Low (4) | Low (4) |
| **Significance** of impact | **Low (28)**<br>(if mitigated) | **Low (28)**<br>(if mitigated) |
| **Status** | Negative | Negative |
| **Reversibility** | Reversible | |
| **Irreplaceable loss of resources** | No | |
| **Can impacts be mitigated** | Yes | |
| **Mitigation** factors | The main mitigation would be to ensure that as little surface disturbance as possible occurs. In addition, avoid any cultivated areas along the Noupoortspruit. Other mitigation measures include:<br>• Avoid any cultivated areas along the Noupoortspruit.<br>• Care must be taken with excavations into soils during and after construction on the site.<br>• Rehabilitate construction sites by using indigenous grasses.<br>• Implement effective erosion control measures and an Erosion Management Plan. | |

Cumulative impacts on soil and agricultural potential as a result of the proposed project are expected to be low as a result of the climatic conditions and the low agricultural potential in the area. The contribution of the project to cumulative impacts is therefore expected to be low to negligible. However, appropriate soil erosion management measures must be implemented during construction to minimize loss of topsoil resources. These would include soil conservation techniques such as geotextiles, contouring or construction of berms, culverts etc and immediate re-vegetation and regular monitoring of all disturbed areas.

## 8. CONCLUSION

The fact that soil information is only available at 1:250 000 can be considered as a knowledge gap. However, the fact that the broad soil types that occur are relatively homogeneous, coupled with the fact that there is limited signs of agricultural activity in the area, make it unlikely that a more detailed soil study would be required. Considering the impacts, including cumulative impacts, there is no reason why the project should not be developed.

## REFERENCES

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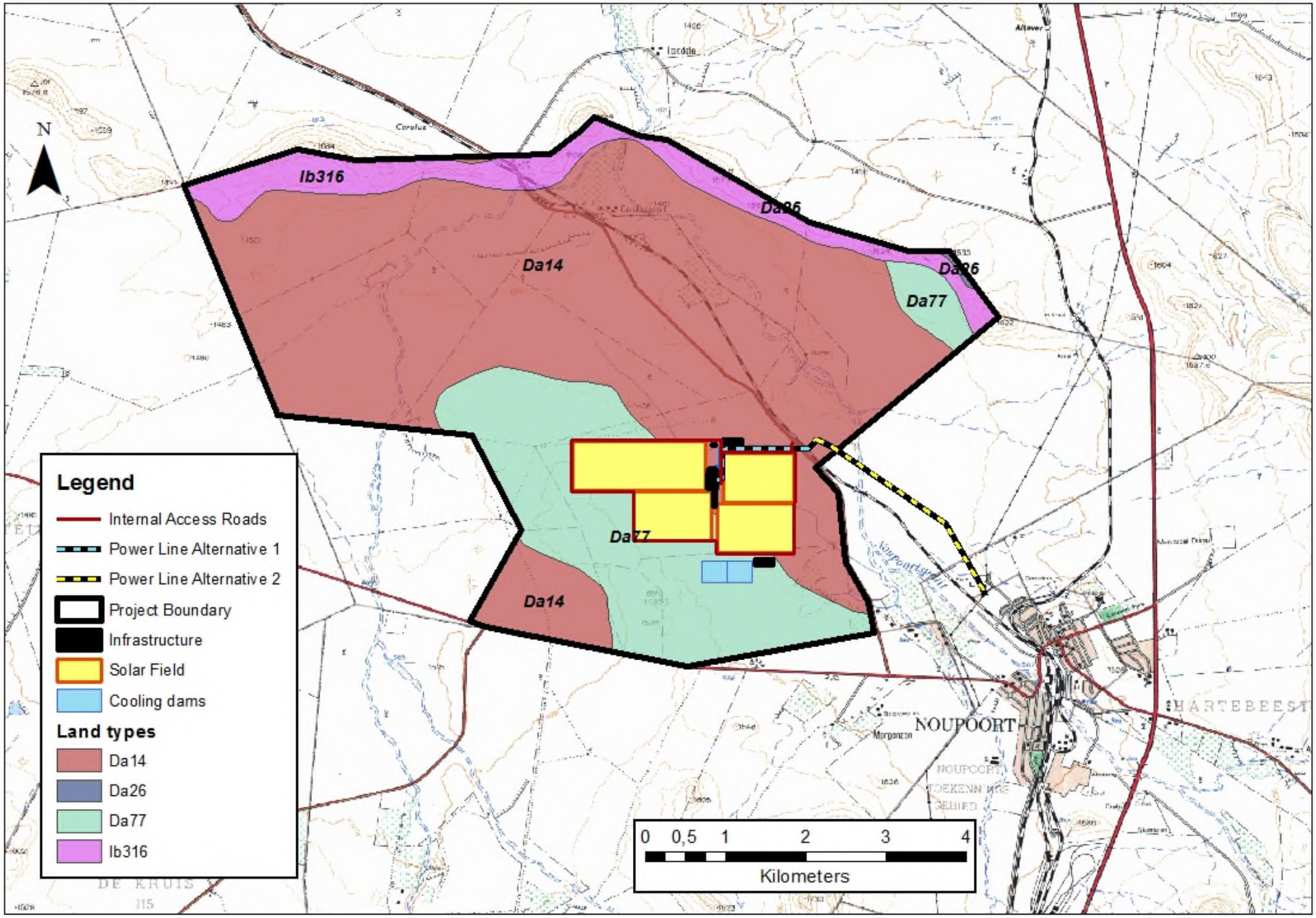
# APPENDIX

# MAP OF LAND TYPES


N
Ib316
Da14
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Da26
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Legend
Internal Access Roads
Power Line Alternative 1
Power Line Alternative 2
Project Boundary
Infrastructure
Solar Field
Cooling dams
Land types
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