SCOPING REPORT

On contract research for

SAVANNAH ENVIRONMENTAL

ARC • LNR

Scoping Study for the proposed Allepad PV Three Photovoltaic Solar Power Project in the Upington District, Northern Cape

Soils and Agricultural Potential

By

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Report Number GW/A/2018/13

September 2018

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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.

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September 2018

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1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by Savannah Environmental to undertake a soil investigation near Upington, in 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 photovoltaic solar facility to be known as Allepad PV Three, as well as a 300 m wide grid connection corridor to the existing Eskom infrastructure.

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
- A comparative evaluation of the identified feasible alternatives, and nomination of a preferred alternative for consideration in the EIA phase
- Identification of potentially significant impacts to be assessed within the EIA phase and details of the methodology to be adopted in assessing these impacts.

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 study area lies approximately 11 km to the north-west of the town of Upington. The position of the site is shown in pink on the map in Figure 1, with the proposed grid corridor shown in blue. The area lies between 28° 21′ and 28° 24′ S and between 20° 03′ and 21° 10′ E.

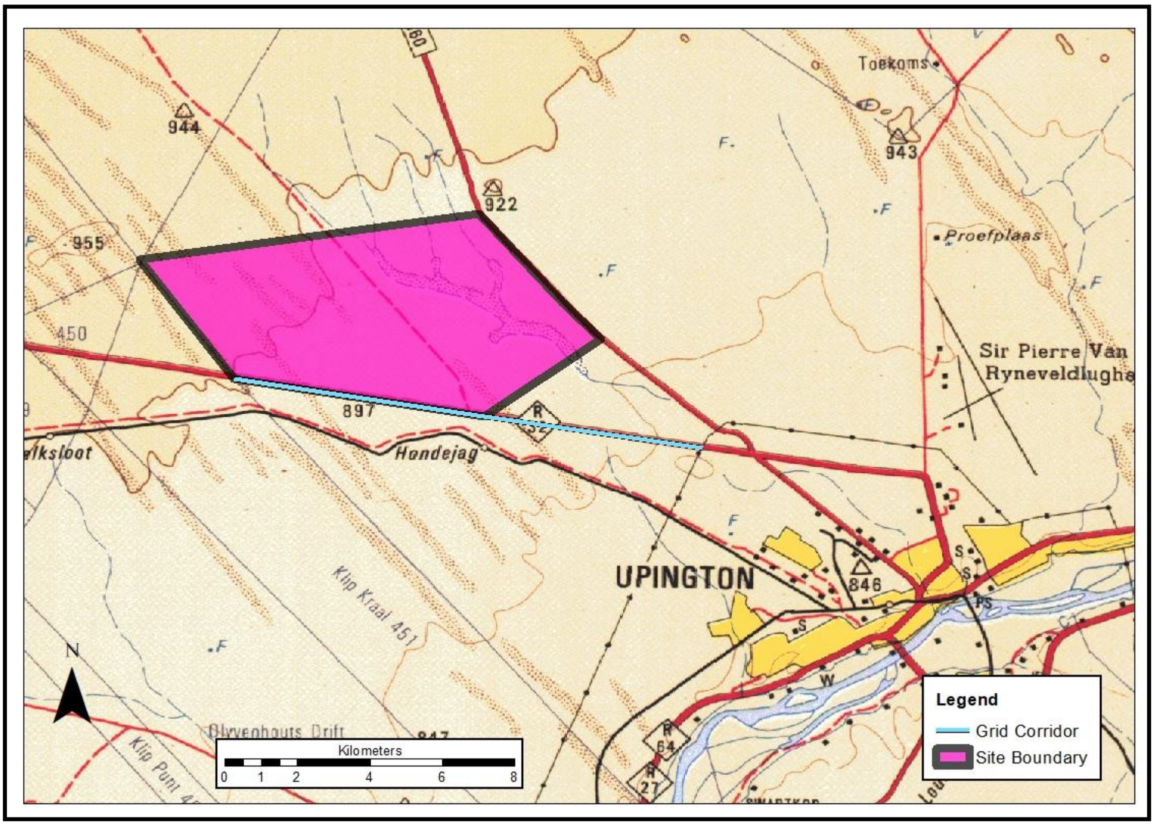


Figure 1 Locality map

2.2 Terrain

The site is generally flat to gently undulating and lies at a height of approximately 860-920 metres above sea level, sloping to the south. The Gariep River (formerly known as Orange River) lies some 15 kilometres to the south east of the project site.

Dunes (north-west/south-east trending) occur across much of the western half of the study area, while in the north-east, there is a network of dry watercourses.

Although these stream beds will be dry in most years, they are a sign of possible water accumulation in the occasional years with above average rainfall.

2.3 Climate

The climate of the study area (Koch & Kotze, 1986) can be regarded as warm to hot with occasional rain in summer and dry winters. The long-term average annual rainfall in this region of the Northern Cape is only 175 mm, of which 142 mm, or 81%, falls from November to April. Rainfall is erratic, both locally and seasonally and therefore cannot be relied on for agricultural practices. The average evaporation is 2 375 mm per year, peaking at 11.2 mm per day in December.

Temperatures vary from an average monthly maximum and minimum of 35.0ºC and 18.7ºC for January to 20.8ºC and 3.3ºC for July respectively. The extreme high temperature that has been recorded is 43ºC and the extreme low –7.9ºC. Frost occurs most years on 6 days on average between mid-June and mid-August.

2.4 Parent Material

The geology of the area comprises wind-blown sands with dunes of the Gordonia Formation, Kalahari Group (Geological Survey, 1988).

3. METHODOLOGY

Existing information was obtained from the map sheet 2820 Upington (Eloff, Bennie, Dietrichsen & Geers, 1983) 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 area under investigation is covered by the following land types, as shown on the map in the Appendix, namely:

- **Ae10** (Deep, red, freely-drained soils, high base status)
- **Af2, Af8** (Deep, red, freely-drained soils, high base status, ***with dunes***)

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. However, given the homogeneous nature of the soils, coupled with the prevailing low agricultural potential, this is not seen as a serious concern.

A summary of the dominant soil characteristics of each land type is given in Table 2 below (the colours correspond to those used in the map in the Appendix).

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 2** below.

Table 2 Land types occurring (with soils in order of dominance)

Land Type	Depth (mm)	Dominant soils	Percent of land type	Characteristics	Agric. Potential (%)
Ae10	450-1000 100-250	Hutton 33/34 Mispah 22	42% 40%	Red, sandy soils, occasionally on hardpan calcrete Red-brown, sandy topsoils on hard rock and calcrete	High:0.0 Mod: 47.0 **Low: 53.0**
Af2	>1200	Hutton 30/31	93%	Deep red, sandy ***dune*** soils on hard rock and calcrete	High: 0.0 Mod: 0.0 **Low: 100.0**
Af8	300-1200 300-900	Hutton 30/31 Hutton 33/34	64% 35%	Deep red, sandy ***dune*** soils on hard rock and calcrete Red, sandy soils, occasionally on hardpan calcrete	High:0.0 Mod: 0.0 **Low: 100.0**

5. AGRICULTURAL POTENTIAL

Much of the western half of the area comprises deep, red, sandy soils, with extensive areas of dunes. The eastern half has a mixture of deep, red, sands and shallow lithosols, often on calcrete (as can be seen from the information contained in Table 2). The very low rainfall in the area (Section 2.3) means that the only means of cultivation would be by irrigation and remote sensing imagery of the area (Figure 2) shows absolutely no signs of any agricultural infrastructure and certainly none of irrigation, which is confined to a strip along the Gariep River.

The climatic restrictions mean that this part of the Northern Cape is suited at best for grazing and here the grazing capacity is very low, around 40-50 ha/large stock unit (ARC-ISCW, 2004).

The dominant class of agricultural potential is low.

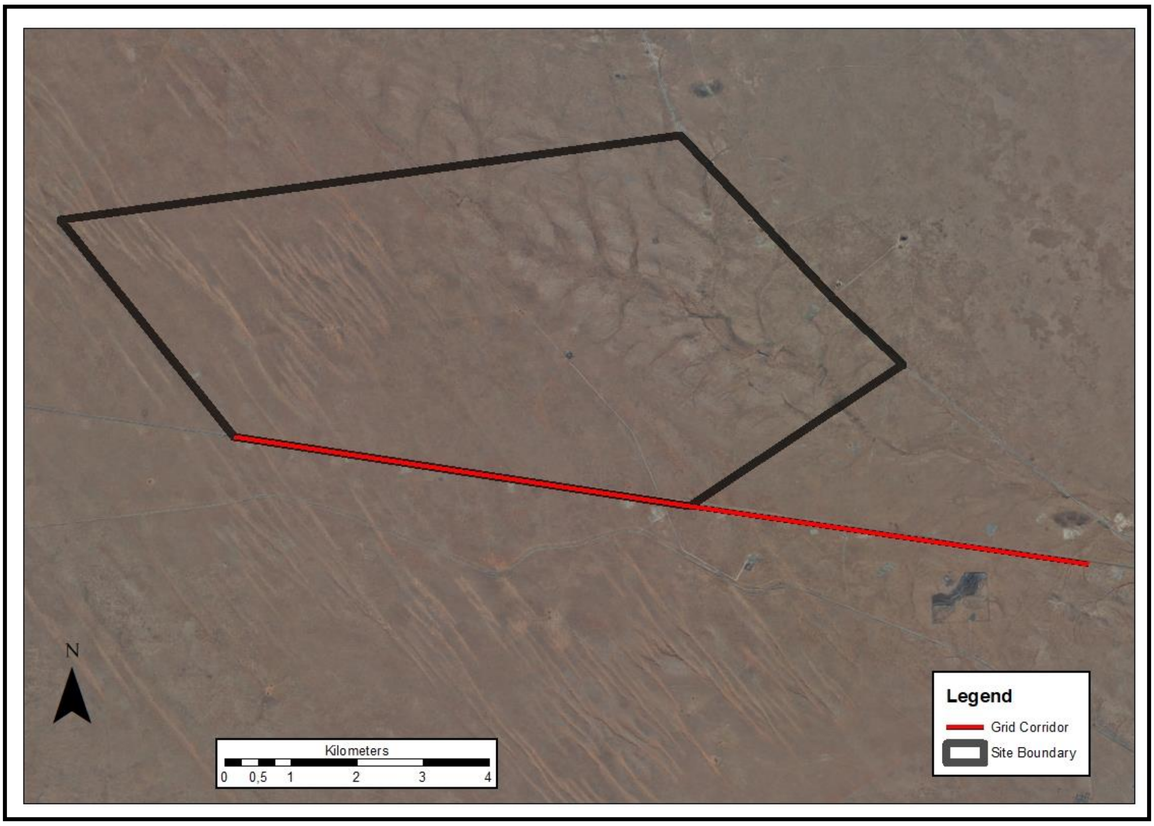


Figure 2 Remote sensing image of study area

6. IMPACTS

The major impact on the soil 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 very 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 3 Impact significance, loss of arable land

Nature of impact	**Loss of agricultural land**	Land that is no longer able to be utilized due to construction of infrastructure
Extent of impact	Site only	Confined to areas within the site where infrastructure will be located
Duration of impact	Long-term	Will cease if operation of activity ceases
Probability of impact	Highly probable	
Severity of impact	Low	
Significance of impact	Low	Mainly due to low potential of area, as well as nature of infrastructure
Mitigation factors	The main mitigation would be to ensure that as little pollution or other non-physical disturbance occurs.	

However, given the prevailing dry climate and sandy soils, a very real hazard would be increased wind erosion due to the construction of the solar panels and associated infrastructure. The area is mapped as "highly susceptible" (ARC-ISCW, 2004).
The impact can be summarized as follows:

Table 4 Impact significance, wind erosion

Nature of impact	**Increased wind erosion**	Topsoil lost due to the action of the prevailing wind
Extent of impact	Areas surrounding site	Wind action can cause soil particles to be transported for considerable distances
Duration of impact	Long-term	As long as soil surface is not stabilized, erosion will continue
Probability of impact	Highly probable	
Severity of impact	Low	
Significance of impact	High	Mainly due to dry climate and sandy soils
Mitigation factors	The main mitigation would be to ensure that as little surface disturbance as possible occurs, and that soil conservation measures are put in place	

Specific measures would need to be put in place during both the construction and operational phases, which would include: absolute minimum removal of vegetation; geotextiles and other soil surface stabilizers; possible construction of windbreaks.

Regarding the grid connection corridor for the proposed power line, the impacts can be regarded as similar to the PV site as a whole. While the power line infrastructure will have a more limited footprint (eg transmission towers), it can be anticipated that an access road will need to be constructed along the corridor, where removal of surface vegetation can be expected to occur. The same mitigation measures as outlined in Tables 3 and 4 would be applicable.

6.1 Sensitive areas

These would include:

- the dune fields in the west which comprise shifting sands with bare surface areas, where wind erosion could be especially severe, and
- the stream channel network in the east, where any disturbance due to construction of infrastructure could lead to disruption of surface flow and possible water erosion. (Although periods of heavy rainfall are rare in this dry environment, rainfall can occur sporadically and may very occasionally be heavy.

Figure 3 below illustrates these areas, shown in orange. However, the boundary lines have been drawn from desk-top information (including the land type data and remote sensing imagery). It can therefore be expected that field ground-truthing might enable these areas to be refined somewhat.

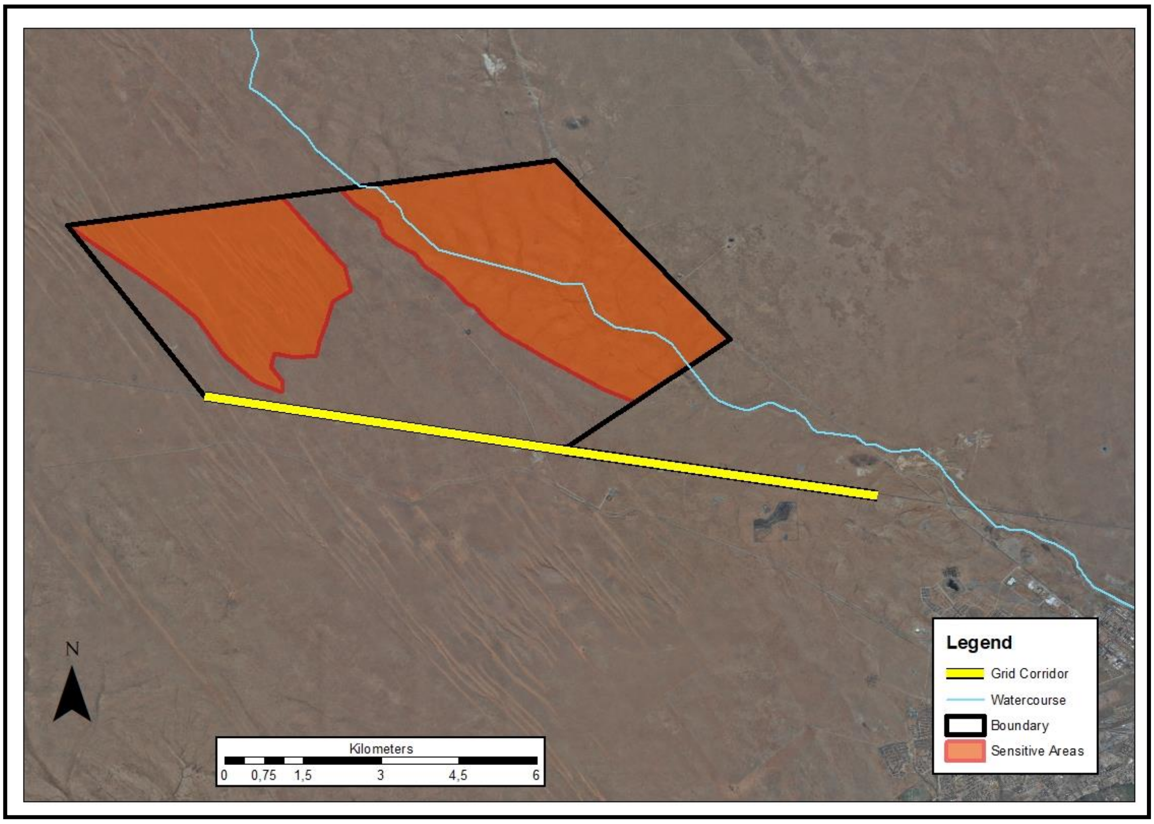


Figure 3 Sensitive areas (dune area to the west, stream bed area to the east)

7 CONCLUSIONS

Due mainly to the prevailing unfavourable climatic conditions for arable agriculture, as well as relatively homogeneous nature of the soils, it is not envisaged that any more detailed soil investigation will be required.

REFERENCES

ARC-ISCW, 2004. Overview of the status of the agricultural natural resources of South Africa (First Edition). ARC-Institute for Soil, Climate and Water, Pretoria

Eloff, J.F., Bennie, A.T.P., Dietrichsen, J.A.V. & Geers, B.C., 1983. Land types of the map 2820 Upington. Field information. *Mem. Nat. Agric. Res. S. Afr.* No. 3. ARC-Institute for Soil, Climate and Water, Pretoria.

Geological Survey, 1988. 1:250 000 scale geological map 2820 Upington. Department of Mineral and Energy Affairs, Pretoria.

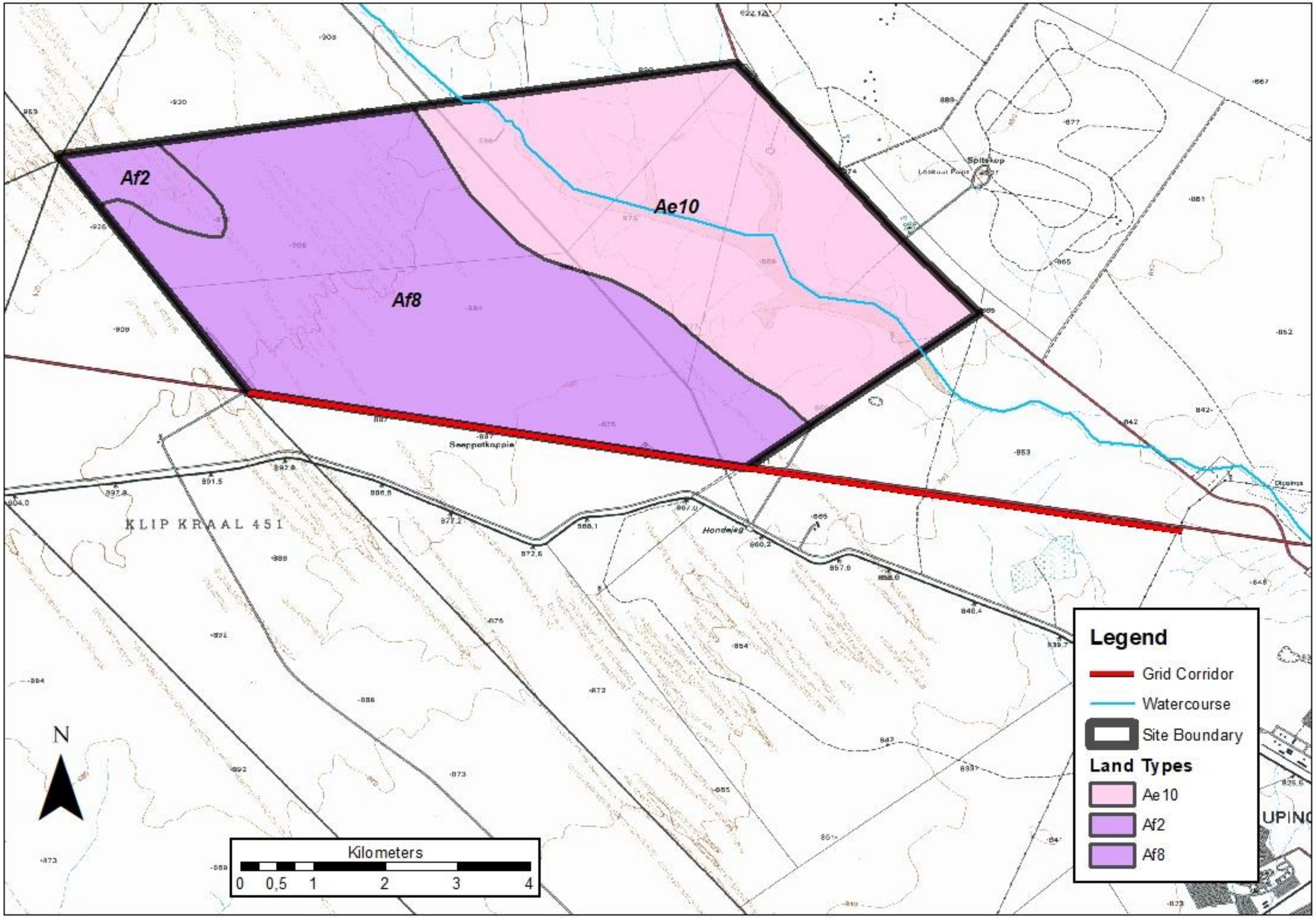
Koch, F.G.L. & Kotze, A.V., 1986. Climate data. In: Land types of the maps SE27/20 Witdraai, 2720 Noenieput, 2722 Kuruman, 2724 Christiana, 2820 Upington, 2822 Postmasburg. *Mem. Agric. nat. Res. S. Afr*. No. 3. Department of Agriculture and Water Supply, Pretoria.

MacVicar, C.N., de Villiers, J.M., Loxton, R.F, Verster, E., Lambrechts, J.J.N., Merryweather, F.R., le Roux, J., van Rooyen, T.H. & Harmse, H.J. von M., 1977. Soil classification. A binomial system for South Africa. ARC-Institute for Soil, Climate & Water, Pretoria.

Soil Classification Working Group, 1991. Soil classification. A taxonomic system for South Africa. ARC-Institute for Soil, Climate and Water, Pretoria.

APPENDIX

MAP OF LAND TYPES


Af2
Ae10
Af8
KLIP KRAAL 451
Spitskop
Seepputkoppie
Hondejeg
N
Kilometers
0 0,5 1 2 3 4
Legend
Grid Corridor
Watercourse
Site Boundary
Land Types
Ae10
Af2
Af8