REPORT

On contract research for

SSI ENVIRONMENTAL / WORLEYPARSONS RSA

and SolarReserve SA (Pty) Ltd

SOIL INFORMATION FOR THE PROPOSED HUMANSRUS SOLAR THERMAL ENERGY POWER PLANT, NEAR POSTMASBURG, NORTHERN CAPE

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
May 2011

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1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by SSI Environmental / WorleyParsons RSA to undertake a soil investigation on a site near Postmasburg, in the Northern Cape Province. The purpose of the investigation is to contribute to the Environmental Impact Assessment (EIA) process for a proposed concentrated solar power (CSP) facility on behalf of SolarReserve SA (Pty) Ltd.

The objectives of this study, which is a desk-top investigation that forms part of the scoping phase assessment, 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

An area was investigated lying approximately 25 km to the east of the town of Postmasburg between 28^o 17' and 28^o 20' S and between 23^o 20' and 23^o 24' E.

The area lies immediately to the south of the R385 Posmasburg-Danielskuil tar road. The position of the site is shown on the map in Figure 1.

2.2 Terrain

The site is generally flat to gently sloping and lies at a height of approximately 1500 metres above sea level (although small areas of slightly steeper topography occur close to the north-eastern boundary). No permanent drainage ways occur in the study area, with only one small seasonal stream running through the south-western portion.

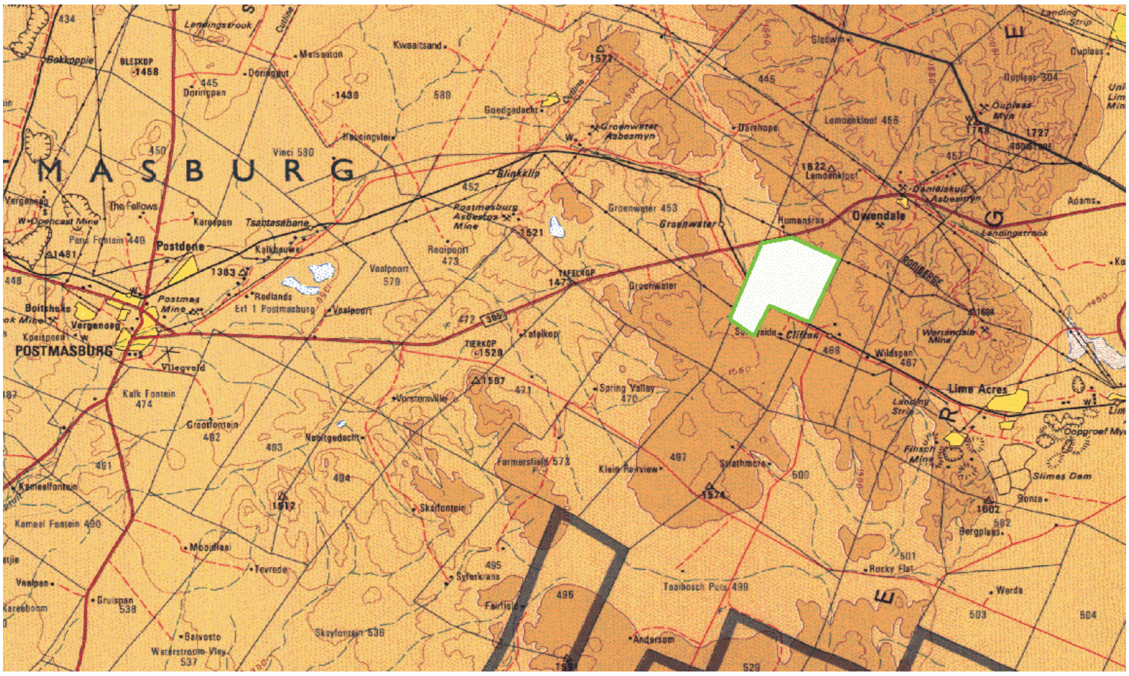

Figure 1 Locality map

2.3 Climate

The climate of the area can be regarded as typical of the northern Karoo interior, with a low, generally summer rainfall distribution, warm to hot summers and cold to very cold winters (Koch & Kotze, 1986). The main climatic indicators are given in Table 1 below.

Table 1 Climate Data

Month	Rainfall (mm)	Min. Temp (°C)	Max. Temp (°C)
Jan	62.6	17.1	33.2
Feb	71.9	16.5	31.5
Mar	84.3	14.5	29.0
Apr	45.3	9.3	26.0
May	19.1	4.7	22.8
Jun	7.8	1.0	19.3
Jul	3.1	0.6	19.8
Aug	7.2	3.0	22.4
Sep	7.5	7.1	26.3
Oct	20.0	11.2	28.9
Nov	29.1	13.7	30.7
Dec	50.1	15.6	32.0
Year	407.9 mm	18.2°C (Average)	

Very warm temperatures (>42°C) may be experienced in summer, while frost in winter (end of March to early September) is not uncommon, and may be severe on occasion.

2.4 Parent Material

The geology of the area comprises rocks of the Griqualand west Sequence (Geological Survey, 1977). In the west, lava of the Ongeluk formation occurs, while in the east, jaspelite, crocodilite and shale of the Danielskuil Formation is present. Much of the central area is covered by wind-blown Quaternary sand deposits.

3. METHODOLOGY

Existing information was obtained from the map sheet 2822 Postmasburg (Eloff *et al.*, 1986) from the national Land Type Survey, published at a 1:250 000 scale. 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 a total of three land types, as shown on the map in the Appendix, namely:

- Ae214, Ae215 (Red structureless soils, high base status)
- Ib237 (Rocky areas with shallow soil)

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 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.

It should be noted that the Agricultural Potential referred to in column 6 is *soil potential only* and does not take prevailing climatic conditions into account.

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

Land Type	Dominant soils	Depth (mm)	Percent of land type	Characteristics	Agric. Potential (%)
Ae214	Hutton 36	300-1200	31%	Red, sandy loam to sandy clay loam soils on hard rock	High:7.0 Mod: 41.3 Low: 51.7
	Hutton 33/36	100-300	30%	Red, loamy sand to sandy clay loam soils on hard rock	
Ae215	Hutton 33	450-1200	81%	Red, sandy soils on hard rock and calcrete	High:0.0 Mod: 92.5 Low: 7.5
	Hutton 30	450-1200	8%	Red, very sandy soils on hard rock and calcrete	
Ib237	Rock	-	61%		High:0.0 Mod: 14.0 Low: 86.0
	Hutton 30/33	50-300	25%	Red, sandy topsoils on rock	

5. AGRICULTURAL POTENTIAL

Much of the central part of the area (land type Ae215) comprises moderately deep to deep soils (300-1200+ mm deep) onto rock, while the remainder has more shallow soils (land type Ae214) or rock (land type Ib237). However, the low rainfall in the area (Table 1) means that the only means of cultivation would be by irrigation and the Google Earth image (Figure 2) of the area shows absolutely no signs of any agricultural infrastructure and certainly none of irrigation.

Figure 2 Google Earth image of study area

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 15-20 ha/large stock unit (ARC-ISCW, 2004).

6. IMPACTS

The project as envisaged will comprise infrastructure as follows:

1. Solar Field – the solar field consists out of all services and infrastructure related to the management and operation of the heliostats.
2. Molten Salt Circuit which includes the thermal storage tanks for storing the hot and cold liquid salt, a concentration tower, pipelines and heat exchangers);
3. The Power Block; and
4. Auxiliary facilities and infrastructure which includes the steam turbine, condenser-cooling system, electricity transmission lines, a grid connection, access routes, water supplies and facility start-up energy plant (gas or diesel generators).

The 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 (due to the low potential soils and the fact that construction of the infrastructure will not involve deep excavations or large-scale topsoil removal) 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, with little impact, especially given the low prevailing agricultural potential.

The impact can be summarized as follows:

Table 3 Impact significance

Nature of impact	Loss of agricultural land	Land that is no longer able to be utilized due to construction of infrastructure
Status of impact	Neutral (N)	No cost or benefit to receiving environment
Spatial Scale of impact	Low (1)	Confined to site boundary
Time Scale of impact	High (3)	Lifespan of project
Probability of impact	Probable (2)	Likely to materialise
Severity of impact	Average (2)	Mitigation & rehabilitation will be possible
Significance of impact	Medium (8)	
Mitigation factors	The main mitigation would be to ensure that as little pollution or other non-physical disturbance occurs.	

It does not appear, from a soils aspect, that there are any especially sensitive areas (“fatal flaws”) within the site that should be avoided.

In conclusion, due mainly to the low potential soils and prevailing climatic limitations for agriculture, it is extremely unlikely that any sort of detailed soil investigation will be necessary.

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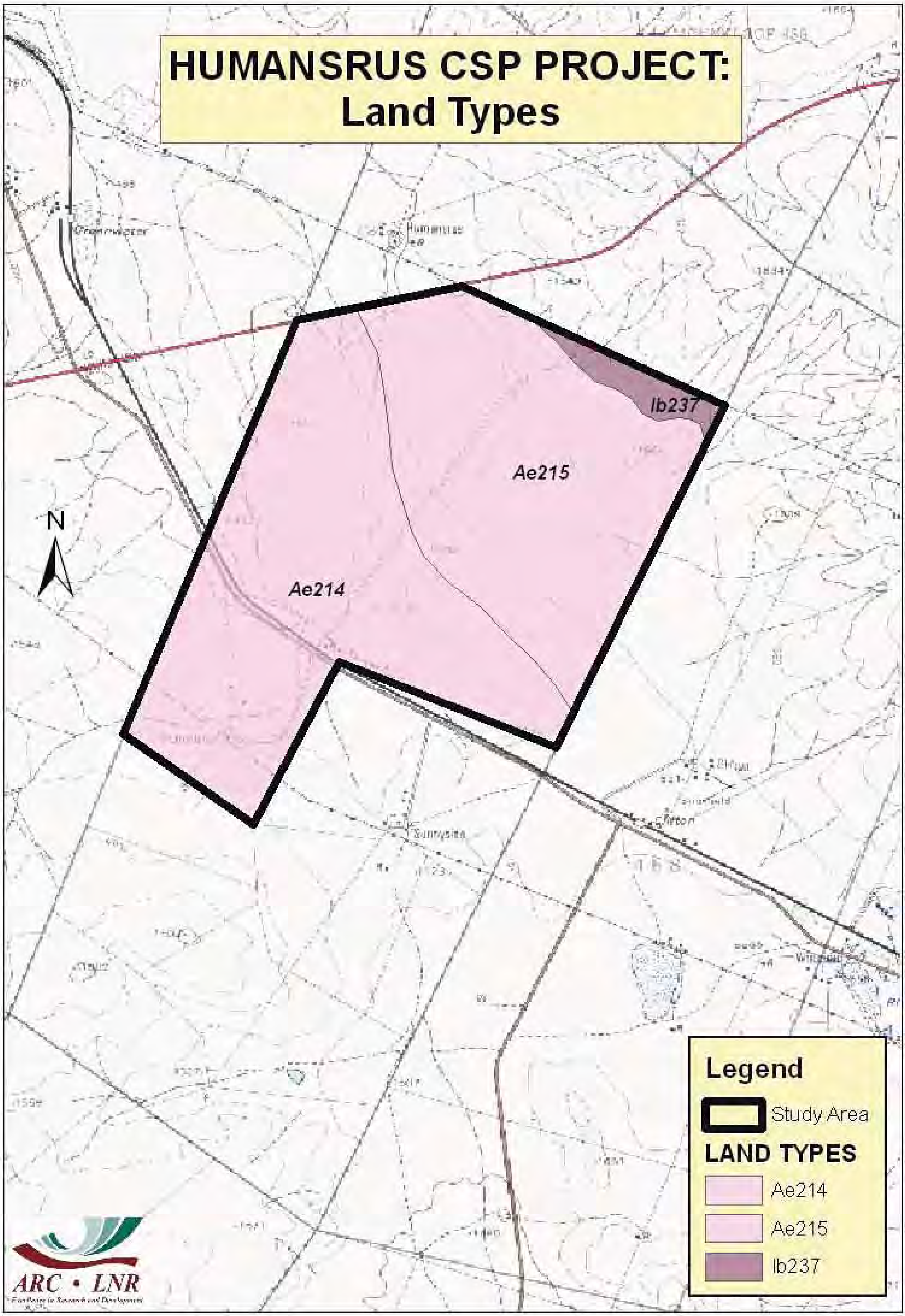
APPENDIX

MAP OF LAND TYPES



HUMANSRUS CSP PROJECT:
Land Types
Ib237
Ae215
Ae214
N
Legend
Study Area
LAND TYPES
Ae214
Ae215
Ib237
ARC • LNR