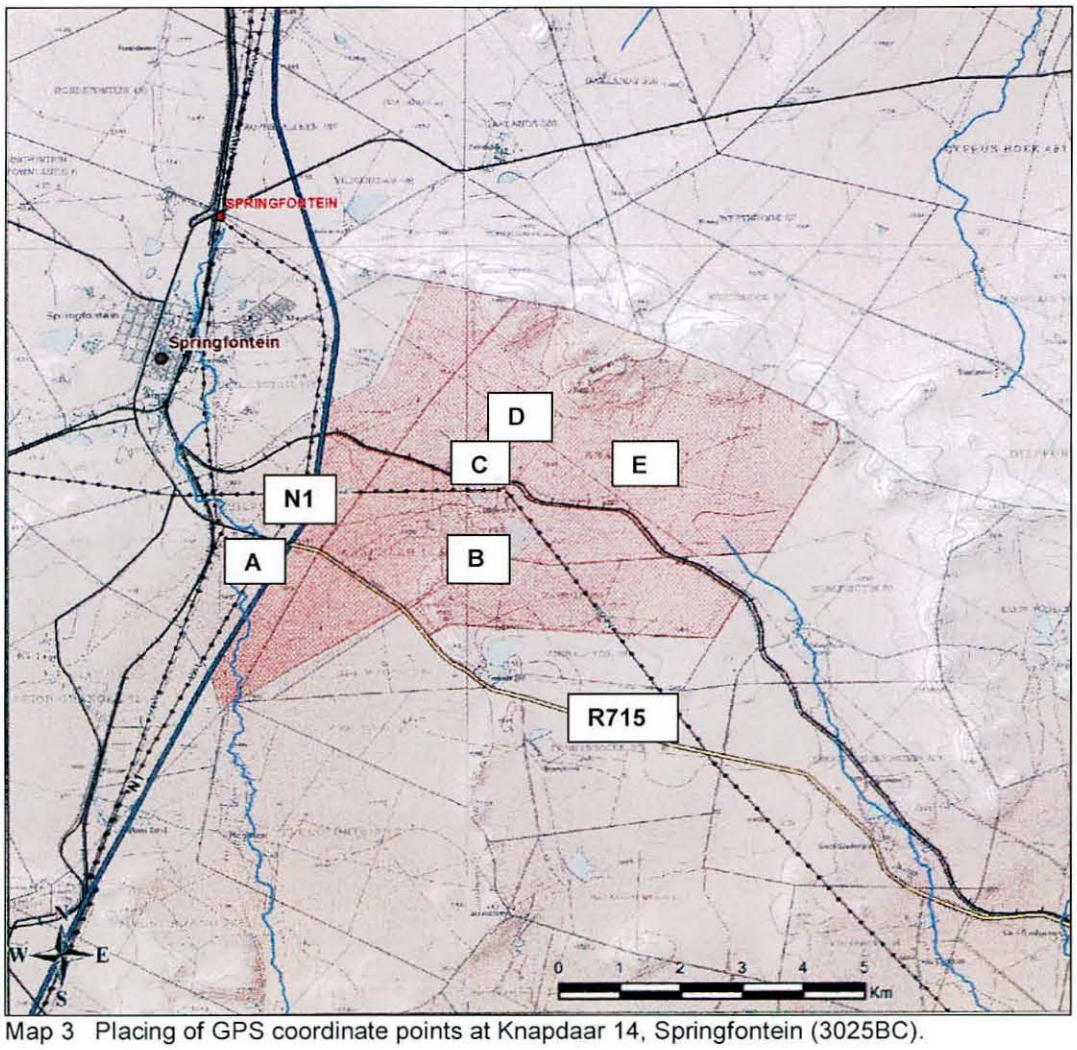


Map 3 Placing of GPS coordinate points at Knapdaar 14, Springfontein (3025BC).

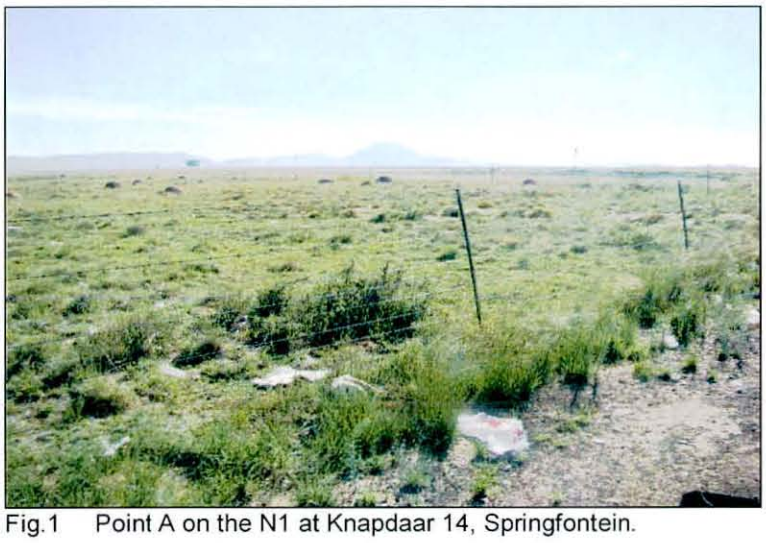
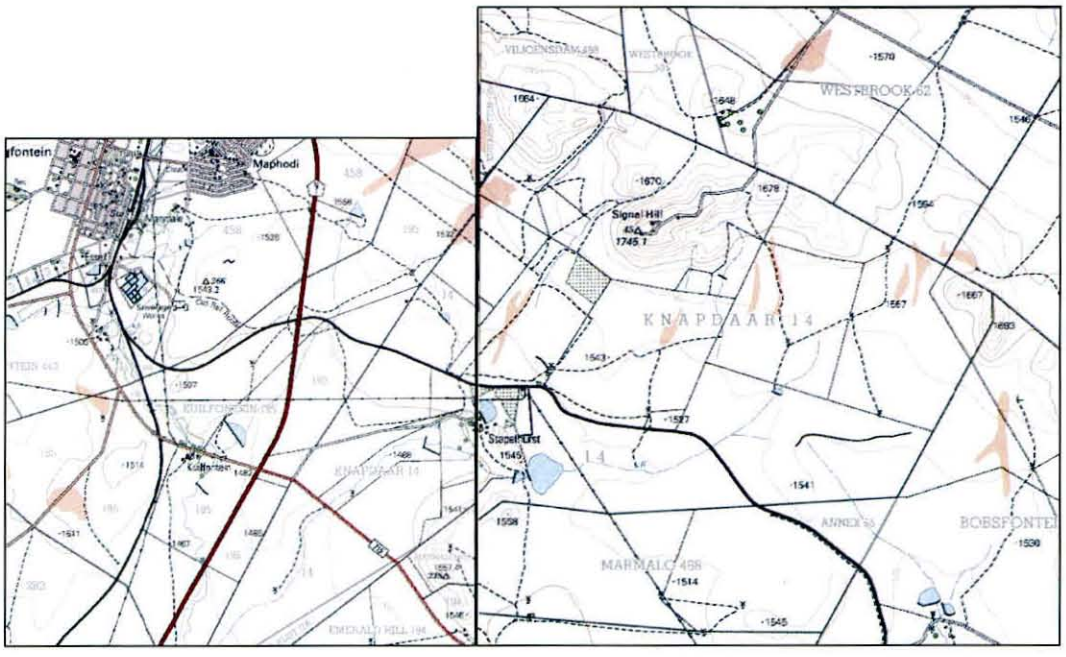


Fig.1 Point A on the N1 at Knapdaar 14, Springfontein.



Map 4 Locality of the farm Knapdaar in relation to the N1 and the R715 main roads (3025BC&BD).

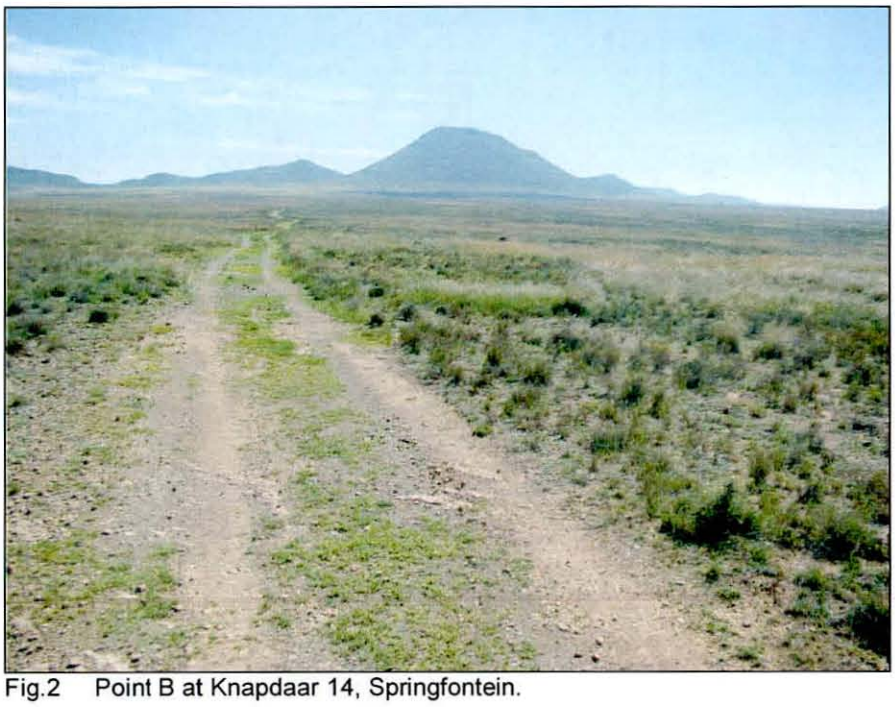


Fig.2 Point B at Knapdaar 14, Springfontein.

Fig.3 Point B at Knapdaar 14, Springfontein.

Fig.4 Point C at Knapdaar 14, Springfontein.

Fig.5 Point C, Knapdaar 14, Springfontein.

Fig.6 Point D at Knapdaar 14, Springfontein.

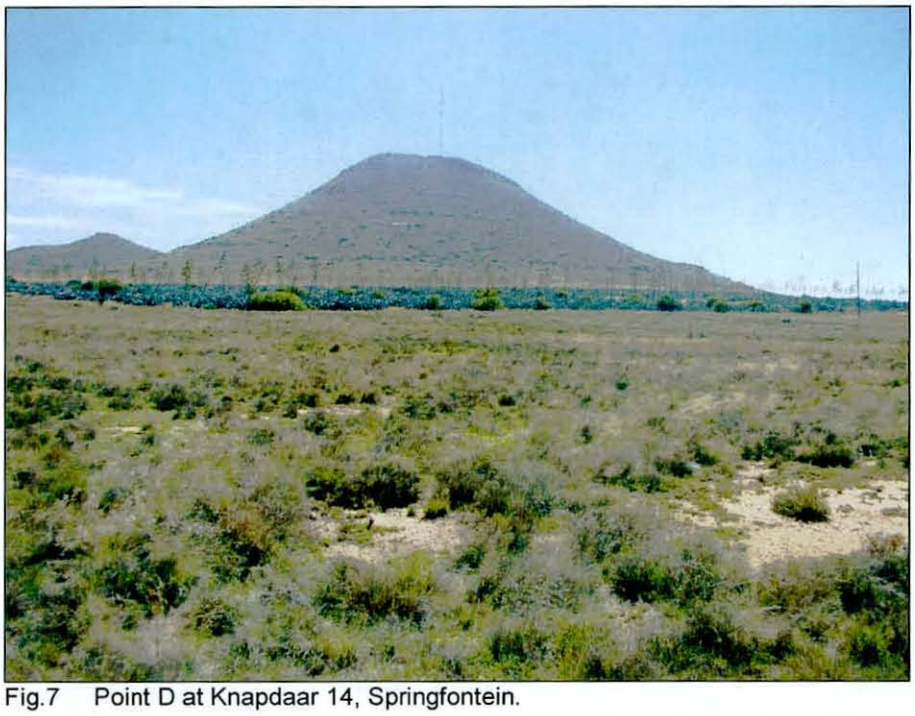


Fig.7 Point D at Knapdaar 14, Springfontein.

Fig.8 Point E at Knapdaar 14, Springfontein.

Fig.9 Point E at Knapdaar 14, Springfontein.

Fig.10 Farm house at Knapdaar 14, Springfontein.

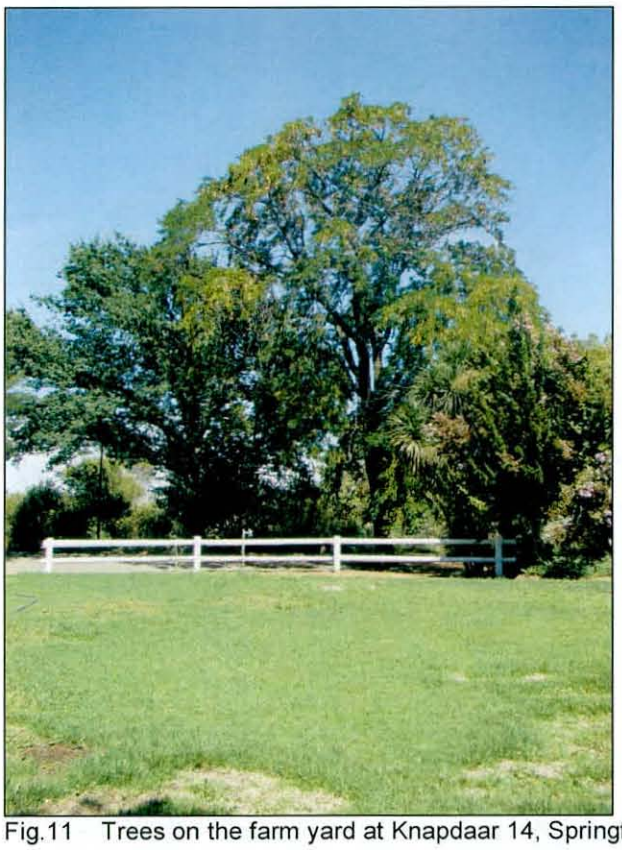


Fig.11 Trees on the farm yard at Knapdaar 14, Springfontein.

Fig.12 Water pipeline at Knapdaar 14, Springfontein.

Fig.13 Soldered Anglo-Boer War milk tin from Knapdaar 14, Springfontein.

Fig.14 Fence gate at railway line on Knapdaar 14, Springfontein.

Fig.15 Detail of fence gate at railway line on Knapdaar 14, Springfontein.


Fig.16 Detail of closing bolt of the fence gate, railway line on Knapdaar 14, Springfontein.

Appendix D.4 Soil/Land and Agricultural Potential Impact Assessment Report

PDF file attached.

D4_Soil & Land and Agricultural Potential Impact Assessment Report

Report on a Soil Survey

as part of an

Environmental Impact Assesment

of the development of a Solar Farm on the soils of

Valleydora Solar Farm

Springfontein

Done for the CSIR

January 2012

By Pieter A.L. le Roux
(Sci.Nat Soil Scientist)

Dept of Soil, Crop and Climate Sciences
University of the Free State
BLOEMFONTEIN

Executive Summary

The site is situated close to Springfontein in the southern Free State. The soils are rated for agricultural (natural pasture, dryland cash cropping, irrigated pasture and irrigated cash crops) and ecological impact (potential pollution and hydropedology). Current environmental conditions are good with no visible degradation. The slope of the terrain is 1.5% and current land use is natural veld used for grazing.

The impact of solar panels on the land will be insignificant in terms of soil degradation and crazing capacity. Alternative land is similar slopes. Impact is limited to:

a. During the construction phase vehicle movement will compact the soil in some degree depending on the number of passes. It will deteriorate vegetation even when driven over once or twice, demolish vegetation in tracks used frequently and remove vegetation where foundations are made for solar panels.
b. Solar panels will shade vegetation from direct sunlight and rain.
c. Cleaning of panels with water will enhance localised water application.

The proposed site is deep Swartland and Oakleaf soils. The Agricultural potential of the soils is limited to grazing and is low. The sustainability of cattle/sheep production at low stocking rates on natural veld on these soils are high.

Table Rating of impacts

Direct Impacts: *Soil compaction and disturbance, vegetation degradation in construction phase*							
Mitigation	Spatial Extent	Intensity	Duration	Probability	Significance & Status		Confidence
					Without Mitigation	With Mitigation	
Prevention, and restricting the range	**Localised on site**	**Low**	**Temporary**	**High**	**Very low**	**Very low**	**High**
Indirect Impacts: *Redistribution of sunlight, temperature and rainwater by solar panels*							
Mitigation	Spatial Extent	Intensity	Duration	Probability	Significance & Status		Confidence
					Without Mitigation	With Mitigation	
IRWH	**Site**	**Low**	**Permanent**	**High**	**Low**	**Positive**	**High**

In spite of reduced growth under the panels due to limited rain, the grazing capacity may be increased by IRWH.

Groundwater recharge potential will be increased by limiting erosion and techniques like IRWH.

Performance of the IRWH structures and process must be evaluated by IRWH experts yearly.

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Glossary of terminology and abbreviations

IRWH Infield Rainwater Harvesting

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1. Introduction

1.1. Locality

The site is situated close to next to Springfontein in the southern Free State (Figure 1).

1.1. Methodology

The land was surveyed to serve as data to analyse the agro-ecosystem and the natural ecosystem and possible impact of a solar farm on these systems. These data are used to evaluate the quality of the soil and terrain for common land-use, including different agricultural land-use types, as required in the EIA process.

The soils were surveyed using soil test pits distributed across the study area. The distribution of the pits were determined by the anticipated soil distribution pattern using Land Type Data (Land Type Survey Staff, 2004) and land surface observations. The soils were classified according to the South African soil classification system (Soil Classification Working Group, 1991). Hand auger observations and correlations with vegetation, soil surface features and terrain were used to complete the survey. Interpolation between observations was used to delineate soil bodies.

The soils are rated for agricultural (natural pasture, dryland cash cropping, irrigated pasture and irrigated cash crops) and ecological impact (potential pollution and hydropedology).

1.2. Condition

Current environmental conditions: The soils are currently in good condition with very limited erosion. Erosion is not associated with current land-use. No future changes to the environment that will occur if the activity does not proceed. The soils were not transformed.

1.3. Land-use

The slope of the terrain is 1.5% and current land use is natural veld used for grazing. No accommodation is next to the site. The current status of the land is good with very little erosion and a good cover of natural veld. Anthropogenic degradation is visible only at gates where vegetation is deteriorated. Possible land use options for the site is grazing by sheep, cattle and/or goats.

1.4. Impact on current use

The impact of solar panels on the land will be insignificant in terms of soil degradation and crazing capacity.

1.5. Alternative sites

The alternative land similar slopes.

2. Impact on the soil and vegetation cover

2.1. Compaction

During the construction phase vehicle movement will compact the soil in some degree depending on the number of passes. It will deteriorate vegetation even when driven over once or twice, demolish vegetation in tracks used frequently and remove vegetation where foundations are made for solar panels.

2.2. Shade

Solar panels will shade vegetation from direct sunlight and rain.

2.3. Extra water

Cleaning of panels with water will enhance localised water application.

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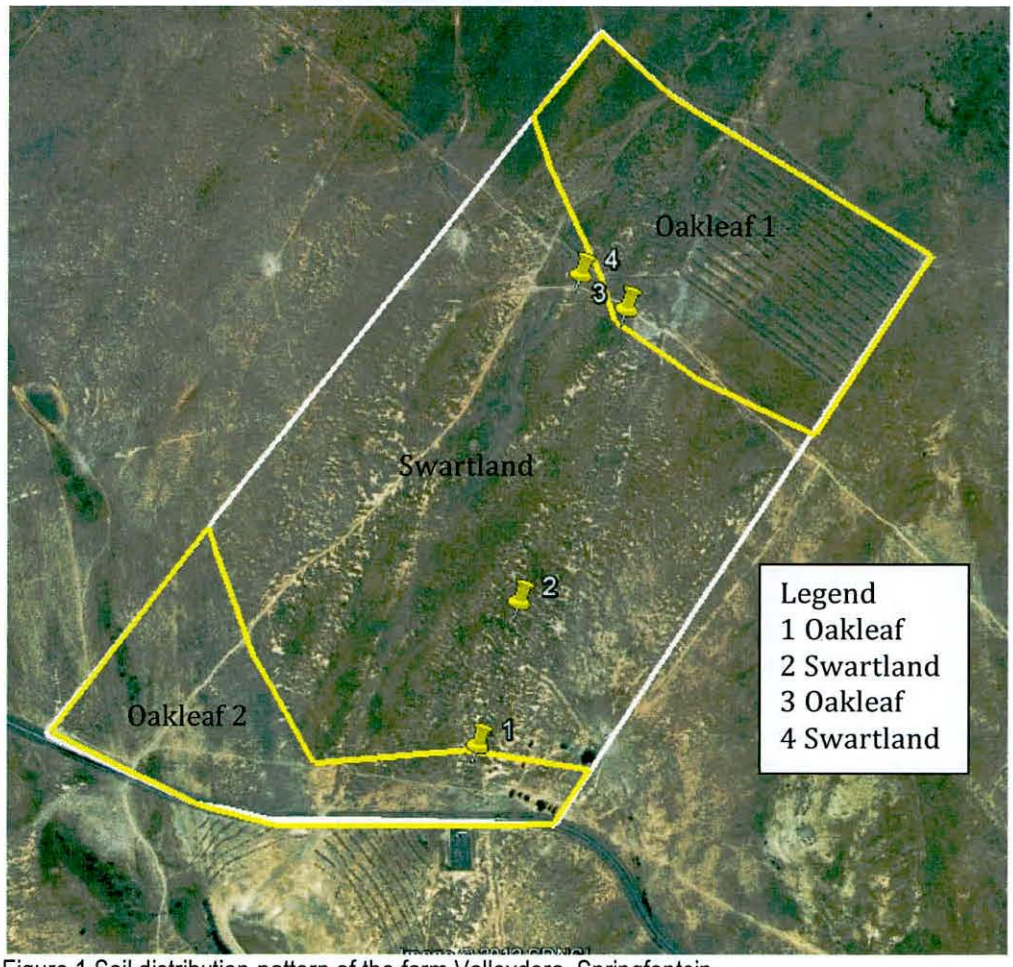

Figure 1 Soil distribution pattern of the farm Valleydora, Springfontein.

3. Description

The surveyed area is relative homogeneous with Swartland soils dominating the site (Figure 1). Oakleaf soils occur closer to the river and higher up.

3.1. Swartland soil form

The Swartland soils are very shallow (0,8m) orthic A/pedocutanic B/saprolite horizons; brown A horizon and red-brown B horizon; clayey texture (15 - 25% and 35 - 45% clay in the A and B horizons respectively).

3.2. Oakleaf soil form

The Oakleaf soils are deep (>1,2m) orthic A/neocutanic B/unspecified material without signs of wetness horizons; brown A horizon and red-brown B horizon; clayey texture (15 - 25% and 25 - 40% clay in the A and B horizons respectively).

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4. Identified issues: Impact of the Solar Farm on the soil and the agricultural ecosystem (potential and sustainability) and natural ecosystem (pollution and hydrology).

4.1. Swartland soil form

4.1.1. *Behaviour*

They are moderately physically active. The soils are sensitive to erosion. The subsoil is more sensitive to erosion and should preferably not be exposed.

4.1.2. *Suitability*

Dryland cropping: The main limitation for dryland cropping is plant available water. The dry climate of Springfontein does not support dryland cropping.

Natural veld: Valsrivier soils accommodate a wide variety of vegetation.

Irrigation of cash crops: Swartland soils have a strong structured and high clay content subsoil and are not suitable for irrigation and is disqualified by the guidelines of the Free State Department of Agriculture.

Irrigation of pasture: Swartland soils have a strong structured and high clay content subsoil and are not suitable for irrigation and is disqualified by the guidelines of the Free State Department of Agriculture.

Ecosystem: Due to the low rainfall soils contribute to hydrology only by overland flow and evapotranspiration.

4.1.3. *Evaluation*

The Agricultural potential of the soils are low (restricted to grazing) and the sustainability of cattle/sheep production on natural veld on these soils are high.

4.2. Oakleaf soil form

4.2.1. *Behaviour*

They are physically and chemically inactive. The soils are slightly sensitive to erosion. The subsoil is more sensitive to erosion and should preferably not be exposed.

4.2.2. *Suitability*

Dryland cropping: The main limitation for dryland cropping is plant available water. The dry climate of Springfontein does not support dryland cropping.

Natural veld: Valsrivier soils accommodate a wide variety of vegetation.

Irrigation of cash crops: Oakleaf soils are suitable for irrigation but irrigation is limited by availability of water.

Irrigation of pasture: Oakleaf soils are suitable for irrigation but irrigation is limited by availability of water.

Ecosystem: Due to the low rainfall soils contribute to hydrology only by overland flow and evapotranspiration.

4.2.3. *Evaluation*

The Agricultural potential of the soils are low (restricted to grazing) and the sustainability of cattle/sheep production on natural veld on these soils are high.

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5. Permit requirements

None

6. Assessment of impacts and identification of management actions

Potentially impacts are soil compaction, soil disturbance and vegetation growth reduction in the construction phase and vegetative growth affected by reduced direct sunlight, lower temperature and localised water accumulation in the operational phase.

Table 1: Rating of impacts

Direct Impacts: *Soil compaction and disturbance, vegetation degradation in construction phase*							
Mitigation	Spatial Extent	Intensity	Duration	Probability	Significance & Status		Confidence
					Without Mitigation	With Mitigation	
Prevention, and restricting range	**Localised on site**	**Low**	**Temporary**	**High**	**Very low**	**Very low**	**High**
Indirect Impacts: *Redistribution of sunlight, temperature and rainwater by solar panels*							
Mitigation	Spatial Extent	Intensity	Duration	Probability	Significance & Status		Confidence
					Without Mitigation	With Mitigation	
IRWH	**Site**	**Low**	**Permanent**	**High**	**Low**	**Positive**	**High**

6.1. Soil compaction, disturbance of soil and harm to the vegetation:

Local, direct impacts of low intensity, temporary duration and very low significance are predicted with a high level of confidence.

6.1.1. Management actions:

During construction vehicles will probably be used to transport equipment on site. The traffic will degrade vegetation. If the soil is wet during construction the wheels of loaded vehicles will compact the soil enhancing erosion and veld degradation.

6.1.2. Mitigation measures

Traffic should be prevented on wet soil, a condition expected more during rainy season.

6.1.3. Positive impacts

None

6.1.4. Monitoring mitigation program

Prevention is important.

6.2. Redistribution of sunlight, temperature and rainwater:

Local, indirect impacts of low intensity, permanent duration, definite but low significance, slightly negative and potentially positive status are predicted with high confidence.

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The solar panels reduce the direct sunlight and rain on vegetation. Direct sunlight can reach shaded areas during early morning and late afternoon. Indirect sunlight will play a role radiating on vegetation. The reduction in direct sunlight has two effects. Firstly it potentially reduces photosynthesis and vegetative growth. Secondly it reduces the temperature of the shaded area. Dry semi-arid regions of South Africa has excessive sunlight and reduction of midday heat may contribute more to vegetative production than what is lost by shading.

Rain water will be redistributed by the solar panels. The water falling on the panels will be accumulated in a line at the bottom of the panels. Swartland soils are sensitive and Oakleaf soils slightly sensitive to erosion.

6.2.1. Management actions:

Erosion must be limited. To limit erosion the runoff must be stopped. Water falling from the panels must be retained and infiltration in the retention area must be increased. Runoff can be limited by small horisontal ridges with basins and infiltration can be enhanced significantly by mulching.

6.2.2. Mitigation measures

The accumulation of rain water of a runoff area on a small area is the basic principle of Infield Rain-Water Harvesting (IRWH) developed at Glen Agricultural Research Station. Soil removed from the foundation pits of the panels can be used to build a small horizontal ridge and basins can be made next to the ridge by hand. The water accumulating in the ridges will boost vegetative growth in and around the basins.

6.2.3. Positive impacts

In spite of reduced growth under the panels due to limited rain, the grazing capacity may be increased by IRWH.

Groundwater recharge potential will be increased by limiting erosion and techniques like IRWH.

6.2.4. Monitoring mitigation program

Performance of the IRWH structures and process must be evaluated by IRWH experts yearly.

7. References

Land Type Survey Staff, 1976-2006. Land type Survey Database. ARC-ISCW, Pretoria.

Soil Classification Working Group, 1991. Soil classification, a taxonomic system for South Africa. Memoirs for the Natural Agricultural Resources of South Africa no. 15. Dept. of Agricultural Development, Pretoria.

8. Appendix: Inventory of Land Type Da51

LAND TYPE / *LANDTIP* ..... : Da51
CLIMATE ZONE *KLIMAATSONE* ..... : 9SS
Area / *Oppervlakte* ..... : 81630 ha
Estimated area unavailable for agriculture
Beraamde oppervlakte onbeskikbaar vir landbou : 200 ha

Occurrence (maps) and areas *Voorkoms (kaarte) en oppervlakte* :
3024 Colesberg (48340 ha) 3026 Aliwal North (33290 ha)

Inventory by *Inventaris deur* :
B C Geurs
Modal Profiles *Modale profiele* :
None / Geen

Terrain unit *Terreineenheid*	1	3	4	5
% of land type% *van landtipe*	15	35	45	5
Area *Oppervlakte (ha)*	12244	28570	36734	4082
Slope / *Helling (%)*	1 - 3	3 - 15	1 - 2	1 - 2
Slope length *Hellingslengte (m)*	50 - 300	300 - 800	800 - 1500	50 - 200
Slope shape *Hellingsvorm*	Y-Z	X-Z	X-Z	X
MB0, MB1 (ha)	4898	19999	33795	4000
MB2 - MB4 (ha)	7347	8571	2939	82

Soil series or land classes / ***Grondseries of landklasse***	**Depth** / ***Diepte*** (mm)	MB	1 ha	1 %	3 ha	3 %	4 ha	4 %	5 ha	5 %	**Total** / ***Totaal*** ha	**Total** / ***Totaal*** %	**Clay content %** / ***Klei-inhoud %*** A	E	B21	Hor	**Texture** / ***Tekstuur*** Class / *Klas*	**Depth limiting material** / ***Diepte-beperkende materiaal***
Soil-rock complex		:																
Grond-rotskompleks:		:																
Rock/Rots		4 :	3673	30	2857	10					6530	8.0						
Mispah Ms10	50-100	3 :	2449	20	4286	15	1837	5			8571	10.5	15-25			A	SaLm-SaCILm	R
Williamson Gs16	100-200	3 :	1224	10	1428	5	1102	3			3755	4.6	15-30			A	SaLm-SaCILm	R
Skilderkrans Sw11.		:																
Brookspruit Sw21.		:																
Rensville Sw10	30-200	0 :	3061	25	11428	40	13592	37	816	20	28897	35.4	15-25		30-45	B	SaCILm-CILm-Cl	so
Nyuka Sw41, Swartland Sw31	30-200	0 :	612	5	2857	10	11020	30	408	10	14897	18.3	15-25		35-45	B	CILm-Cl	so
Glendale Sd21, Makatini Hu37	300-600	0 :	612	5	2857	10	3673	10	122	3	7265	8.9	15-25		35-45	B	CILm-Cl	R
Sherrocks Hu36, Mangano Hu33	100-400	0 :	612	5	2857	10	1837	5			5306	6.5	10-25		10-30	B	fiSaLm-SaCILm	R
Craven Va21, Swaerskloof Sc16.		:																
Lindley Va41	60-300	0 :					3673	10	1225	30	4898	6.0	15-25		25-45	B	CILm-Cl	vr.pv.vp
Makulak Oa27, Letaba Oa26	600-1200	0 :							816	20	816	1.0	15-25		25-40	B	SaCILm-CILm-Cl	so
Limpopo Oa46, Mutale Oa47	600-1200	0 :							612	15	612	0.8	15-30		15-40	B	SaCILm-CILm	so
Stream beds/Stroombeddings		4 :							82	2	82	0.1						

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Appendix D.5 Visual Impact Assessment Report

PDF file attached.

D5_Visual Impact Assessment Report

Visual Impact Assessment for the Construction of a Photovoltaic Power Plant near Springfontein, Free State.

Draft Scoping Report

Submitted to CSIR

20January 2012

CSIR
our future through science

MetroGIS

Visual Impact Assessment for the Construction of a Photovoltaic Power Plant near Springfontein, Free State.

Draft Scoping Report

Table of Contents:

Maps:

VISUAL IMPACT ASSESSMENT:
Scoping Report.

1. INTRODUCTION

MetroGIS was appointed by CSIR, to undertake a visual impact assessment (VIA) with regard to the construction of a photovoltaic (PV) power plant near Springfontein in the Free State. The proposed development area consists of the following farm portions, as indicated on the location map provided by CSIR:

- Remainder of the farm Kuilfontein-195,
- Remainder of the farm Knapdaar-14,
- Remainder of the farm Marmalo-488

The location and extent of these farms are displayed on the map in Figure 1.

The VIA forms part of an Environmental Impact Assessment study (EIA) that is being undertaken by CSIR on behalf of Solairedirect, the applicant, who is proposing to construct a 75MW Solar Energy Facility (SEF) on the above mentioned properties.

The VIA is being undertaken by Dawie Jansen van Vuuren in his capacity as professional GIS science practitioner and VIA specialist. He has been involved in VIA studies since 2006 and has subsequently undertaken numerous VIA studies involving a wide range of developments, including power generation facilities (Solar, Wind, OCGT, CCGT, UCG), transmission lines and substations, all of which relate to energy infrastructure. Mr Jansen van Vuuren has been appointed as an independent consultant to undertake the visual impact assessment for the proposed Solar Energy Facility. Neither he, or MetroGIS will benefit from the outcome of the project decision-making.

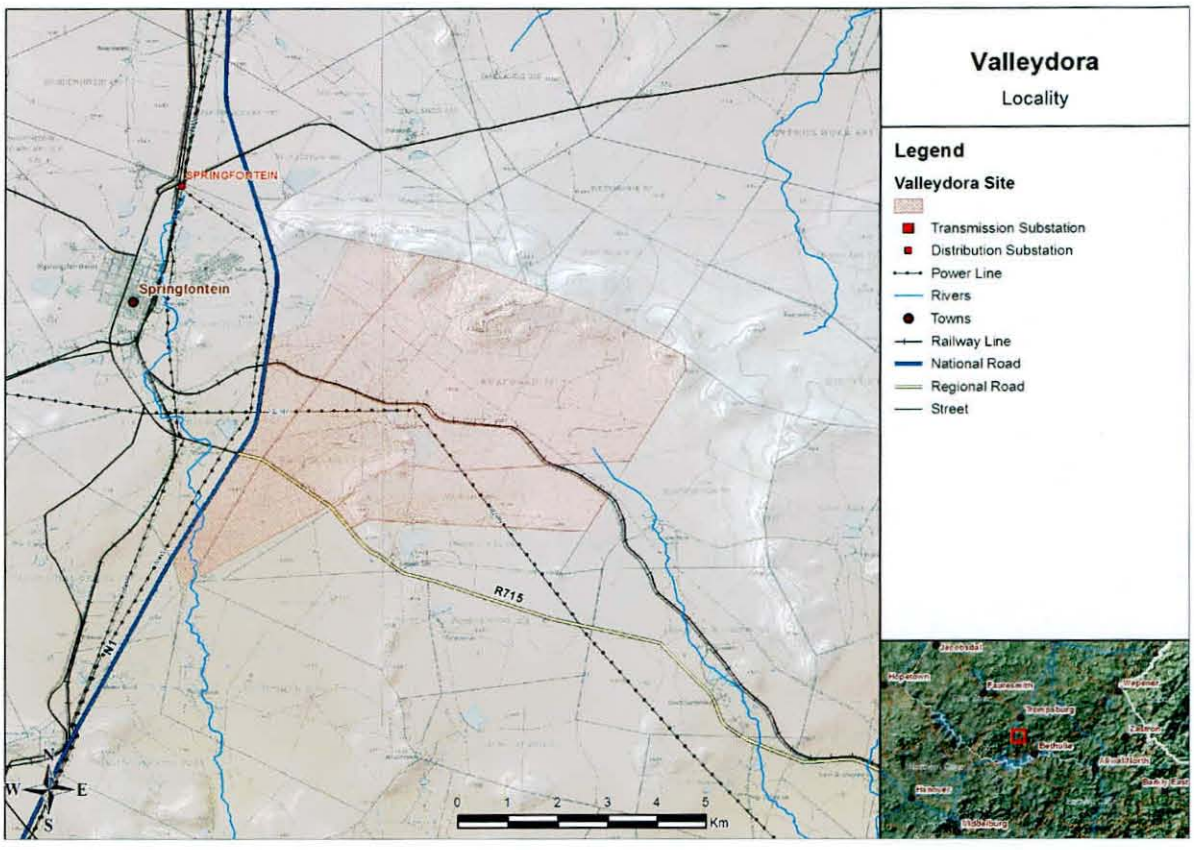

Figure 1: Location of the proposed PV plant development area.

The EIA project is currently in its scoping phase. This document describes issues relating to possible visual impact on a scoping level. In this phase, the type and extent of the proposed development and the character of the receiving environment is analysed, thereby determining the scope of visual impact issues that need to be addressed in the next phase, when a detailed visual impact assessment is undertaken.

2. SCOPE OF WORK

The scope of work for this study as a scoping level visual impact assessment. The purpose is to define the spatial context / sphere of influence of the proposed development in terms of visibility, and to identify possible sensitive viewer locations. The spatial context of the study is determined by a visibility analysis, and the proximity of viewer locations to the proposed solar

plant. This is based on existing information as it is collated in a geographic information system (GIS) and interpreted as a desktop study.

For the purpose of this scoping report, the study area has been demarcated as a buffer of approximately 30km from the boundaries of the proposed development area.

3. METHODOLOGY

All objects are visually perceived by virtue of spatial dimensions. Within the visual sense, we as humans obtain clues about reality through size, brightness, colour and texture information. The arrangement of objects on the surface of the earth, and locations given by their neighbourhood relations, are important features of spatial situations which are relevant in all spatial analysis tasks. Thus the spatial domain can be used particularly well to model reality and convey knowledge by means of symbolic representation (as in maps). Based on this theoretical concept, GIS technology is used as a primary tool for visual impact analysis.

The following GIS activities are undertaken:

- **Data Sourcing**. Information with regard to the proposed project and the type of solar technology (in particular the spatial extent of major components) is important to determine visibility and exposure. In this respect spatial data (location and layout) with regard to the PV plant must be provided by the client. In addition, data with regard to the physical environment is extracted for a 30km radius around the site and collated into a dedicated GIS project, providing input for spatial analysis and modelling.
- **Data processing**. In order to conduct spatial analysis, data need to be prepared in the required format. For the purpose of a viewshed analysis, a DTM is generated from existing 20m topographical contours.
- **Spatial Analysis.** A viewshed analysis is undertaken to determine visibility. This is based on the spatial distribution and heights of the SEF infrastructure, being

representative of an extensive development with specific vertical dimensions and footprint.

- **Mapping.** Having processed spatial data, maps have been created to visualise the following environmental attributes:
    - Topography;
    - Land use / Land cover;
    - Vegetation;
    - Visibility.
- **Interpretation.** By interpreting the information depicted by maps, it is possible to Identify sensitive environments or areas upon which the project could have a potential visual impact. Critical areas will be highlighted during this phase, which will be studied in more detail during the next phase.

4. PROJECT DESCRIPTION

A formal layout of the SEF has not yet been finalised, but infrastructure is likely to include the following:

- An array of PV panels that would cover a total surface area of 150ha;
- Underground cabling between the PV panels;
- Invertors;
- A power line that is likely to connect to a new substation on the development site;
- An administrative building;
- Internal access roads;
- A new substation on the development site;
- Security lighting;
- Security fence.

5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

The project is located in a semi-arid region with an average annual rainfall of 312mm. The region is associated with farming activities where mostly sheep and cattle are kept.

The town of Springfontein is a small settlement 3km west of the development site. The town was established in 1904 at a regional railway junction and provides limited tertiary services to the surrounding farming community.

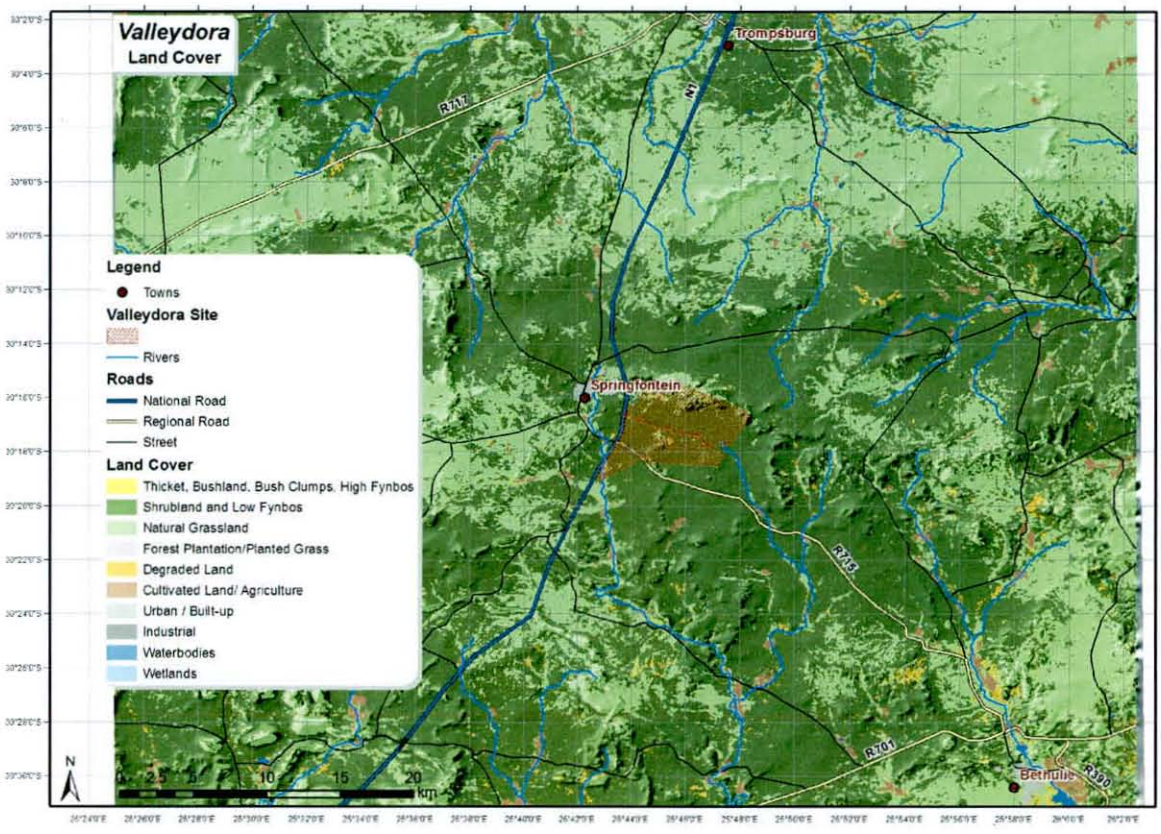

Figure 2: Land use / Land cover around the proposed site.

Farmsteads are widely spread, with an associated low rural population density.

Infrastructure in the study area consist of a network of roads, powerlines, substations, railway lines, and communication towers on koppies. The N1 national road between Bloemfontein

and Colesberg abuts the development area on its western boundary. An arterial road (the R715), a railway line and transmission line transect the development area from east to west.

Visual resources originate from the natural environment, as it is shaped by topographical features and vegetation cover (refer to the photograph in Figure 3). The region is characterised by an undulating topography with prominent koppies and ridges. Combined with wide plains of grassland, and interspersed with thicket, bushland and bush clumps, a unique landscape with coherent visual character is formed, providing aesthetically pleasing views in places. At night, especially moonless nights, the skies reveal rarely seen clear views of the stars, with particularly the milky way etched against a pitch black night sky.

The location of a town within 3 – 6 km from the development site, as well as existing infrastructure such as transmission lines and highly visible communication towers, have collectively established visual impacts in the region, which may provide some visual absorption capacity to mitigate the visual impact of the SEF. This will be further analysed during the EIA phase of the project.

Figure 3: Topography and natural environment around the proposed development site.

6. VISIBILITY AND VISUAL EXPOSURE

Visibility is determined by a line of sight where nothing obscures the view of an object. Exposure is defined by the degree of visibility, in other words "how much" of it can be seen. This is influenced by topography and the incidence of objects such as trees and buildings that obscure the view partially or in total. Visibility can be modelled by making use of a digital terrain model (DTM), and applying a viewshed analysis using GIS software. The map in Figure 4 shows the result of a preliminary viewshed analysis for the PV panels, at a height of 4.5m above ground level. The array of panels have been placed in a preliminary block of 150ha, in the centre of the development site, north of the railway line.

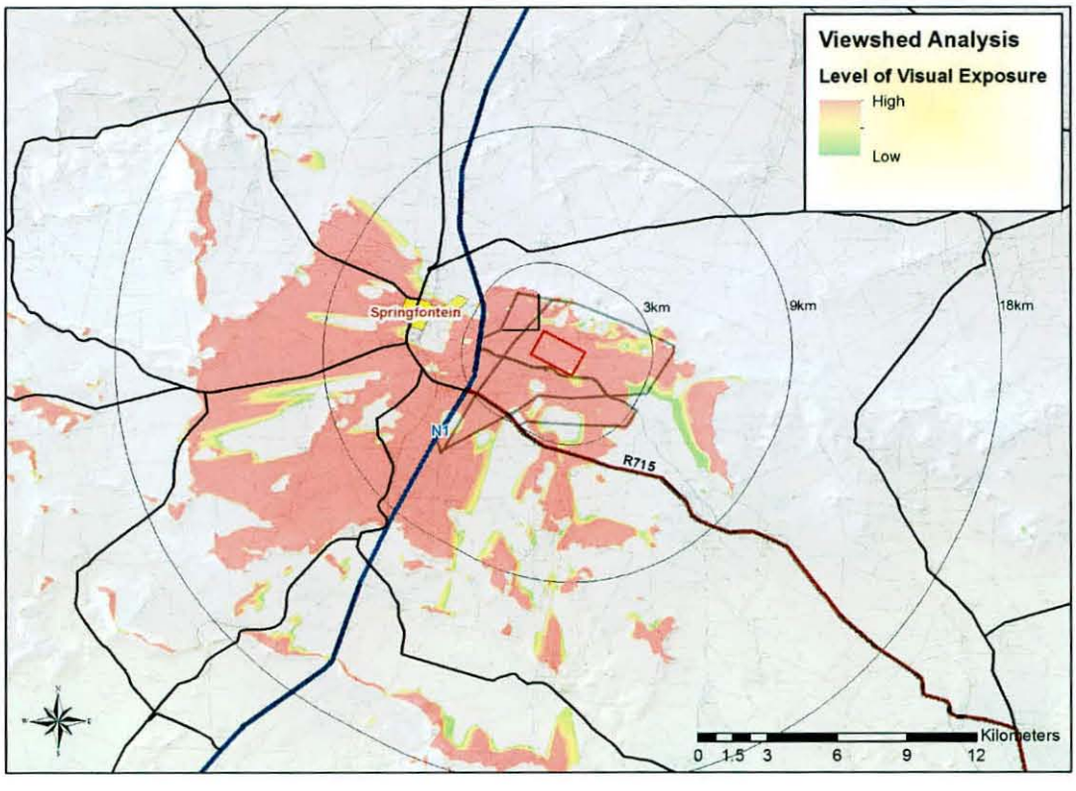

Figure 4: Viewshed analysis of PV panels depicting possible visibility.

The viewshed analysis reflects a core zone of possible visibility for 3km to the east, south and west of the facility. High ridges and koppies (Seinheuwel) north of the development area

effectively screen the SEF from exposure to the north. Within this zone, visual exposure is expected to be high with possible high impacts.

Visibility extends further south-west and west to distances of up to 14km from the site. To the south and east, visibility is limited to isolated spots, as indicated on the map in Figure 4.

Visual exposure is expected to decrease with distance from the development site. Within the zone of 3 – 9km from the site, visual exposure is expected to be moderate to low. Within the zone of 9 – 18km from the site, visual exposure is expected to be low to very low, beyond which any exposure of the SEF will be insignificant in relation to the dominant landscape at such distances.

The modelling of visibility is merely conceptual. Being based on DTM data, it does not take into account the effect of buildings, trees etc. that could shield the facility from being visible. The viewshed analysis therefore signifies a worst-case scenario. The immediate landscape surrounding the observer has a determining influence on long distance views. It is expected that vegetation may offer some degree of visual screening, especially where tall trees occur around farmsteads.

Once a final layout of the SEF is completed, the viewshed analysis will be regenerated and refined to reflect the visual exposure of the development according to its actual position in the landscape. This will be undertaken during the EIA phase of the project.

7. POTENTIAL VISUAL RECEPTORS

The viewshed analysis gives an indication of possible visual exposure to a number of receiving environments. It is envisaged that the proposed PV plant will be visible to residents

in Springfontein and on farmsteads, observers travelling along nearby roads, and visitors to the area.

Information obtained during the site visit indicate that a number of guest houses are located near Springfontein and on other nearby farms. Although Springfontein is not known as a tourist destination, these guest houses, located in a tranquil rural environment, may be regarded as sensitive visual receptors.

8. ISSUES RELATING TO POSSIBLE VISUAL IMPACT

The following issues are anticipated regarding possible visual impact:

- The visual exposure of the SEF occupying a space of 150ha, which is more or less the same extent as the town of Springfontein;
- The exposure of the SEF components and potential visual impact in respect of sensitive receiving environments, including the following:
    - The town of Springfontein and nearby Maphodi township;
    - Farmsteads on surrounding farms;
    - Observers travelling along roads, especially the N1 and the R715; and
    - Guest houses in the area.
- Potential impact of the facility on the visual character of the landscape and sense of place of the region;
- The potential visual impact of operational, safety and security lighting at night time on observers living in close proximity to the site;

9. CONCLUSIONS AND RECOMMENDATIONS

The development of a PV plant on the proposed development site involves the construction of solar panels, invertors, a substation, buildings, and a security fence that will by highly visible to observers within 3 – 5km from the facility.

Visual receptors include residents in Springfontein and on farmsteads, visitors to guest houses and travellers on the N1 and other roads in the area.

It is recommended that the potential visual impact on these receptors be assessed in further detail. Additional analyses must be undertaken, such as a detailed proximity analysis and visual absorption analysis, taking into account the effect of existing development nearby. More detailed viewshed analyses will be undertaken of all major SEF components, based on the final layout of the facility.

This work must be undertaken during the next phase (EIA phase) for this project.

REFERENCES/DATA SOURCES

Chief Director of National Geo-spatial Information, varying dates. *1:50 000 Topo-cadastral maps and digital data.*

CSIR/ARC, 2000. *National Land-cover Database 2000 (NLC 2000)*

National Botanical Institute (NBI), 2004. *Vegetation Map of South Africa, Lesotho and Swaziland (Unpublished Beta Version 3.0)*

Appendix D.6 Palaeontology Impact Assessment Report

PDF file attached.

D6_Palaeontology Ecosystem Impact Assessment Report

Desktop Palaeontological Assessment of a proposed Solar Photovoltaic Facility near Springfontein, FS Province.

Report prepared for
CSIR Environmental Management Services
By Lloyd Rossouw
PO Box 38806
Langenhovenpark
Bloemfontein, 9330

Executive Summary

- The affected area is underlain by Late Permian Beaufort Group sediments of the lower Adelaide (*Pa*).
- These sediments form the base on which younger, weakly developed superficial deposits of Late Cenozoic age have been deposited and include pedocretes, colluvial slope deposits, sheet wash and alluvium.
- The proposed development will impact on fossil-bearing Adelaide Subgroup strata especially during the construction phase, if excavations into bedrock are required.
- There are no objections to the proposed development on palaeontological grounds provided that access by a specialist should be facilitated at the appropriate stage **during the construction phase** of the development and
- that newly uncovered objects of palaeontological significance, found during the course of excavation activities are reported to the appropriate heritage authorities

Introduction

The report is a preliminary assessment of potential paleontological impact with regard to the proposed development of a Solar Photovoltaic Facility at Valley Dora near Springfontein. The present study was commissioned by CSIR Environmental Management Services in March 2012 and the assessment was carried out in accordance with National Heritage Resources Act 25 of 1999.

Methodology

The palaeontological significance of the affected area was evaluated through a desktop study and carried out on the basis of existing field data, database information and published literature.

Site Information

1 to 50 000 topographical maps 3025 BC Springfontein and 3025 BD Bethulie

General site coordinates: 30°16'51.07"S, 25°45'33.86"E

The affected area is located on the farm Valley Dora (Knapdaar 14), immediately west of Springfontein (**Fig. 1**). The proposed development area itself represents approximately 600 ha of farmland (**Fig. 2**).

Local Geology

The geology of the region has been described by Le Roux (1993) and Johnson (2006) and is shown on the 1: 250 000 geological map 3024 Colesberg (Council for Geoscience, Pretoria 1997). The affected area is underlain by Late Permian Beaufort Group sediments of the lower Adelaide (*Pa*). These sedimentary rocks form the base on which younger, superficial deposits of Late Cenozoic age have been deposited (Partridge *et al.* 2006). This include pedocretes, colluvial slope deposits, sheet wash and alluvium. Dykes and sills of resistant Jurassic dolerites (*Jd*) determine the relief of the surrounding area to the south and southwest (**Fig. 2**). The igneous Jurassic dolerites are not fossiliferous and can be excluded from further consideration in the present palaeontological assessment.

Regional Palaeontology

The affected area is situated within the *Dicynodon* Assemblage Zone (AZ) near the latter's eastern boundary with the Early Triassic sediments of the younger *Lystrosaurus* AZ (Rubidge 1995) (**Fig. 2 & 3**).

The *Dicynodon* Assemblage represents the terminal phase of the Palaeozoic continental biota, that was dominated by therapsid "mammal-like reptiles" and *Glossopteris* Flora before it was largely wiped out by the end-Permian Mass Extinction Event (Ward *et al.* 2005). Fossil types from this biozone are listed in Keyser & Smith (1978-79) and Kitching (1995). Therapsids from this biozone occur generally well-preserved in mudrock horizons and are usually found as dispersed and isolated specimens associated with an abundance of calcareous nodules (Kitching 1995). Other vertebrate fossils include palaeoniscoid fish and crocodile-like temnospondyl amphibians.

Overlying Late Cenozoic valley fill deposits may occasionally contain much younger fossil biotas, including the skeletal remains of Quaternary mammals (Klein 1984) non-marine molluscs and a variety of other microfossils.

Impact Statement

The proposed development will impact on fossil-bearing Adelaide Subgroup strata (**Fig. 4**) especially during the construction phase if excavations into bedrock are required. Such fresh exposures may well be of palaeontological interest.

Recommendation

There are no objections to the proposed development on palaeontological grounds provided that the following conditions are adhered to as part of site management policy:

- that access by a specialist should be facilitated at the appropriate stage during the construction phase of the development and
- that appropriate and effective mitigation measures such as inspection of fresh excavations are undertaken by a professional palaeontologist in order to

determine whether, as is probable, palaeontological remains or features are exposed *in situ.*

- that newly uncovered objects of palaeontological significance, found during the course of excavation activities are reported to the appropriate heritage authorities and
- that such finds may require a Phase 2 rescue operation at the cost of the developer.

References

Le Roux, F.G. 1993. Die geologie van die gebied Colesberg. Explanation to 1: 250 000scale geological sheet 3024 Colesberg, 12 pp. Council for Geoscience, Pretoria.

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Keyser, A.W. & Smith, R.M.H. 1978-79. Vertebrate biozonation of the Beaufort Group with special reference to the western Karoo Basin. *Annals of the Geological Survey of South Africa* 12: 1-35.

Kithcing, J.W. 1977. The distribution of Karoo Vertebate Fauna. Bernard Price Institute for Palaeontological Research. Memoir 1, 1 – 131.

Klein, R.G. 1984. The large mammals of southern Africa: Late Pliocene to Recent. In: Klein, R.G. (Ed.) *Southern African prehistory and paleoenvironments*, pp 107-146. Balkema, Rotterdam.

Macrae, C. 1999. *Life etched in stone*. Fossils of South Africa. 305pp. The Geological Society of South Africa, Johannesburg.

Partridge, T.C. *et al.* 2006. Cenozoic deposits of the interior. **In**: M.R. Johnson, *et. al.* (eds). *The Geology of South Africa*. Geological Society of South Africa.

Rubidge, B. S. 1995. (ed.) *Biostratigraphy of the Beaufort Group*. Biostrat. Ser. S.Afr. Comm. Strat. 1, 1 – 45.

Ward, P.D. et al. 2005. Abrupt and gradual extinction among Late Permian land vertebrates in the Karoo Basin, South Africa. *Science* 307: 709-714.

Declaration

L. Rossouw does independent specialist consulting and is in no way connected with the proponents of the development, other than delivery of consulting services.

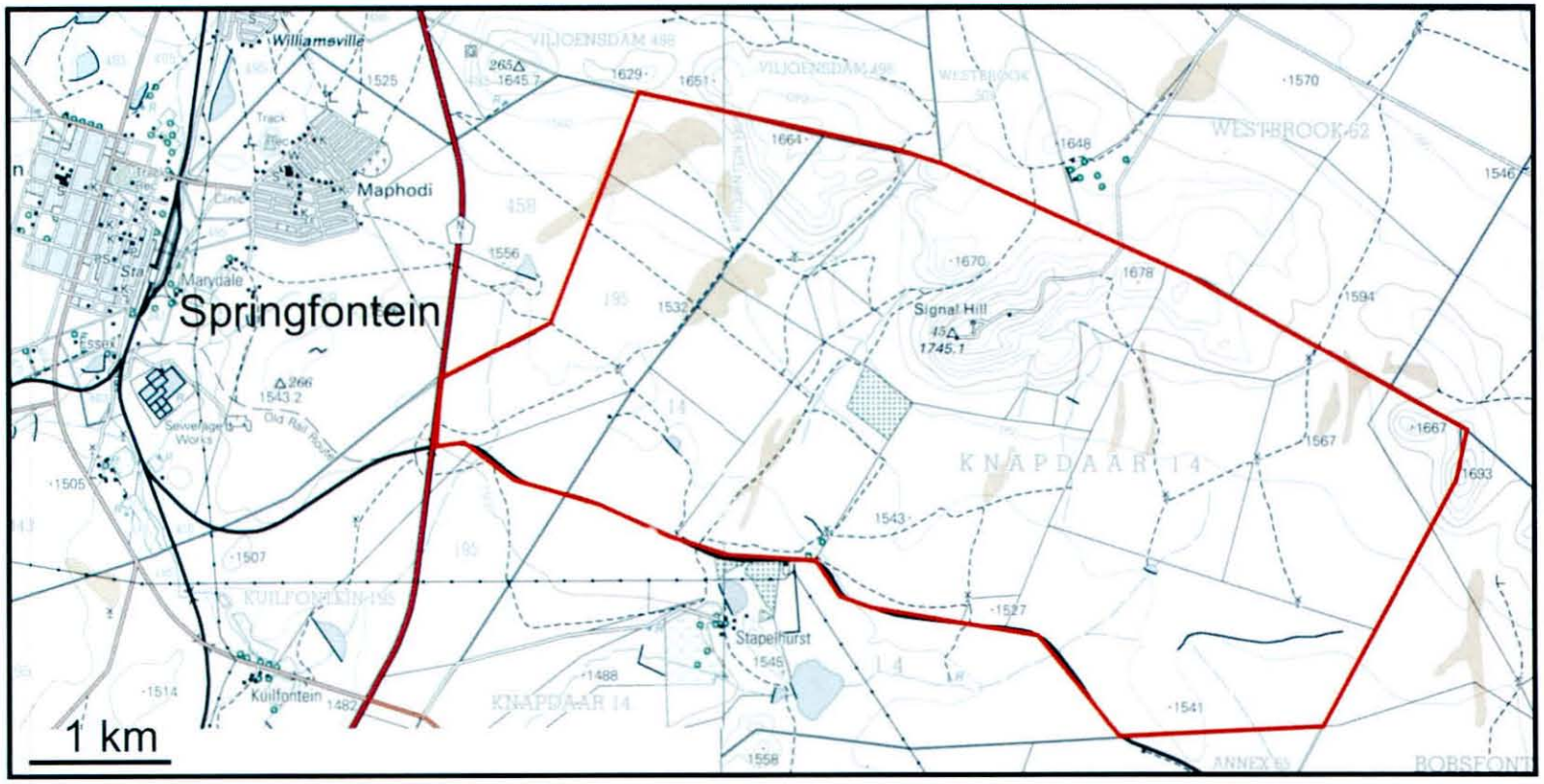

Figure 1. Portion of 1 : 50 000 scale topographic map of the affected area (red line).

Figure 2. Portion of 1 : 250 000 scale geological map (3025 Colesberg) of the affected area. The geology in the area is represented by late Permian Adelaide (**Pa**) and early Triassic Tarkastad Subgroup sediments (**Trk**), and early Jurassic dolerite intrusions (**Jd**).

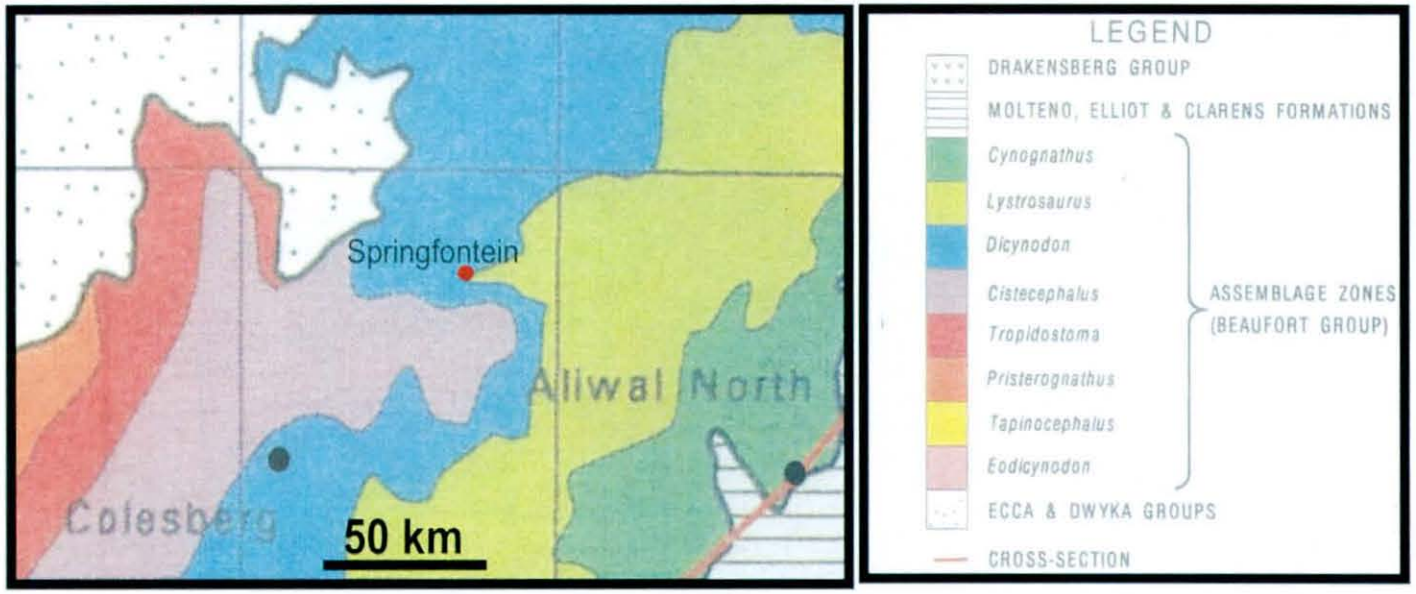

Figure 3. Geographical distribution of vertebrate biozones of the Beaufort Group around Springfontein (Rubidge 1995).

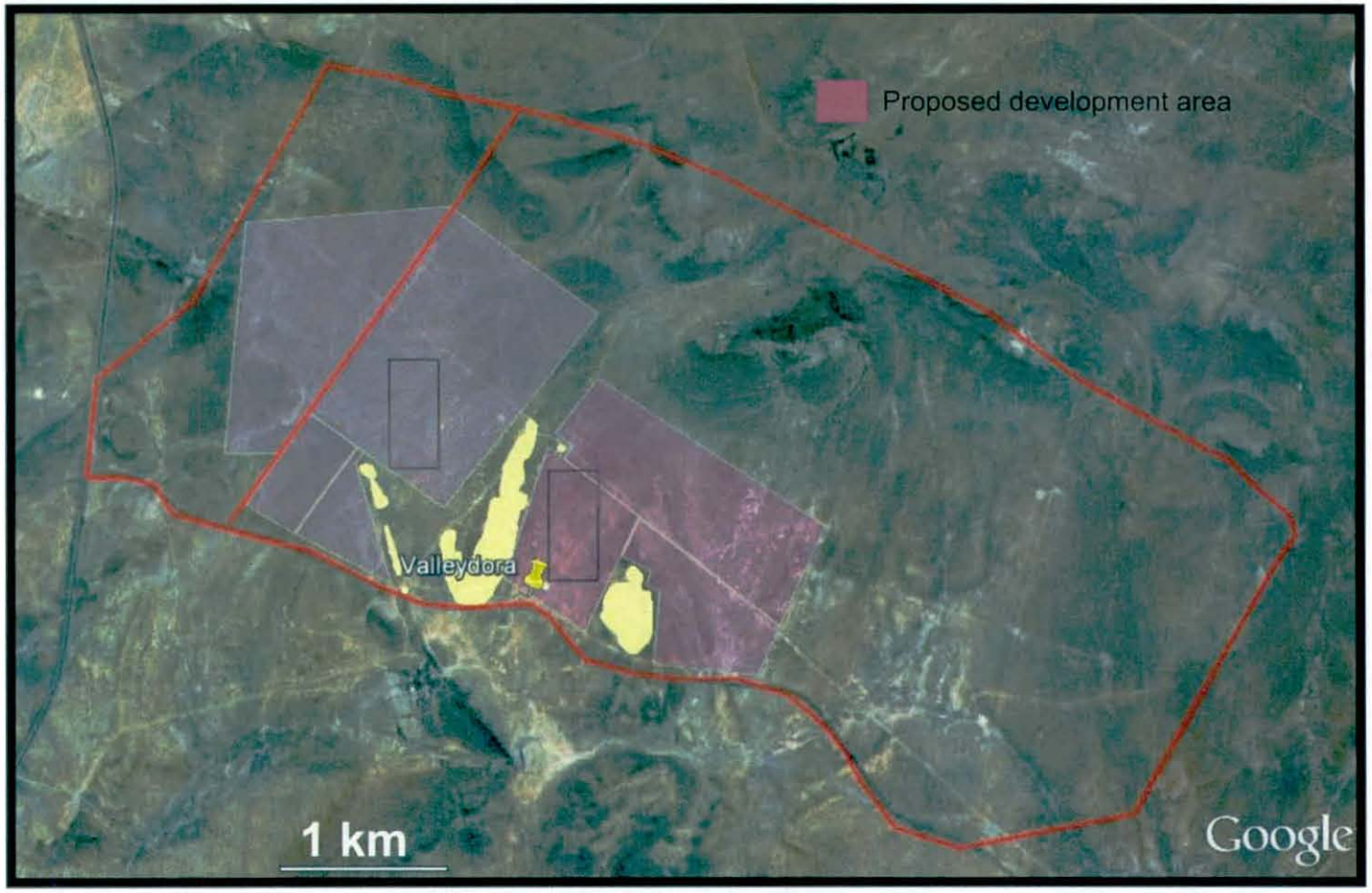

Figure 4. Aerial view of the affected area.

Appendix D.7 Social Impact Assessment Report

PDF file attached.

D7_Social Impact Assessment Report

SOCIAL ASSESSMENT

FOR

SCOPING REPORT

PROPOSED VALLEYDORA PHOTOVOLTAIC POWER PLANT

FREE STATE PROVINCE

(DRAFT REPORT)

JANUARY 2012

Prepared for

CSIR

By

Tony Barbour

Tony Barbour

ENVIRONMENTAL CONSULTING AND RESEARCH

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EXECUTIVE SUMMARY

The CSIR was appointed by Solairedirect as the lead consultant to manage the Environmental Impact Assessment (EIA) process for the establishment of the proposed Valleydora photovoltaic solar energy facility (PVSEF) and associated infrastructure on Farm Valleydora Nr. 2163. The proposed site is located ~ 140 km south-west of the town of Bloemfontein in the Free State Province, South Africa.

Tony Barbour was appointed by the CSIR to undertake a specialist Social Impact Assessment (SIA) as part of the EIA process. The terms of reference for the study include a scoping level assessment to identify key social issues that would need to be addressed as part of the EIA. This report contains the findings of the initial scoping level social assessment undertaken as part of the EIA process. The scoping study was based on a review of desktop sources only. These included a brief outline of the proposed project, key policy documents, as well as contextual and demographic sources such as the 2001 Census. The author also drew on experience from SIAs undertaken for other renewable energy projects in various parts of South Africa.

The proposed Valleydora PVSEF has a generation capacity of 75 MW. The total area earmarked for the PVSEF is approximately 150 ha and the energy will be linked via a 132 kV power line from an on-site substation to the Eskom grid. The project is therefore an Independent Power Producer (IPP) project.

The site is located within the Kopanong Local Municipality (KLM). The Kapanong Local Municipality (KLM) had a population of 55 936 in 2007, accounting for ~41% of the DM's population. The XDM IDP (2010/11) estimates that the KLM population has been declining by ~2% per annum between 2001 and 2007.

In 2005, the General Government Services sector contributed the biggest share of the LM GDP accounting for 19%. This contribution percentage was followed by Agriculture, Forestry and Fishing (16%), Finance and Business Services (13%), Wholesale and Retail (13%), Transport and Communication (12%), Community Services (9%), Electricity and Water (6%), Manufacturing (5%), Mining (4%) and Construction (3%).

The KLM IDP (2010/11) notes that the extremely narrow economic base of the LM, i.e. the dependency of local communities on agriculture production, increases the LM's vulnerability to economic downturns and adverse agricultural conditions, due to prolonged droughts and low prices for agricultural goods, such as wool. As such, IDP (2010/11) states that it is important that the central thrust of any economic development strategy for the LM should aim to diversify the economic base.

The KLM IDP (201/11) notes that the LM has a high level of illiteracy especially in the rural areas due to the lack of facilities and adequate resources. The lack of quality education the rural areas has exacerbated rural depopulation and increase urban in-migration which in turn has contributed to social problems brought about by unemployment. Of the 3 LMs that make up the XDM, the KLM has the highest number of employed people in the District estimated at over 35 961 (2006) people in formal and informal employment market. However, according to the KLM IDP (2010/11), approximately 40.2% of people in the Municipality are living in poverty.

The key conclusions of the Scoping level study are the following:

- The establishment of concentrated solar energy facilities is supported at national, and provincial level;
- The proposed site appears to be compatible with the spatial development vision of the Free State Province and the MMM;
- The potential negative impacts associated with the construction phase include the presence of construction workers on the site, potential impact on farming activities and farm infrastructure and the movement of construction vehicles.
- The potential positive impacts relate to the creation of local employment and skills development opportunities; and
- Key potential operational phase issues relate to the potential negative impacts on farming livelihoods associated with loss of land and impacts on the scenic integrity (visual) of the landscape. Positive impacts relate to the provision of renewable energy for South Africa and the creation of employment opportunities.

The investigation and assessment of social impacts during the EIA phase will be guided by the Guidelines for specialist SIA input into EIAs adopted by the Western Cape Environmental authorities. The approach will include:

- Identification of key interested and affected parties;
- Meetings and interviews with interested and affected parties;
- Identification and assessment of key social issues based on feedback from key interested and affected parties.
- Identification of mitigation measures aimed at avoiding and or minimizing potential negative social impacts; and
- Identification of mitigation measures aimed at enhancing potential positive social impacts.

TABLE OF CONTENTS

ACRONYMS

CSP =	Concentrated solar power
DEA&DP	Department of Environmental Affairs and Development Planning (Western Cape)
DM	District Municipality
DoE	Department of Energy
EIA	Environmental Impact Assessment
FSPGDS	Free State Provincial Growth and Development Strategy
GDPR	Gross Domestic Product of the Region
HDI	Human Development Index
IDP	Integrated Development Plan
IPP	Independent Power Producer
IRP	Integrated Resource Plan
KLM	Kopanong Local Municipality
kV	Kilovolts
LED	Local Economic Development
LM	Local Municipality
MMM	Mangaung Metropolitan Municipality
MW	Megawatt
PGDS	Provincial Growth and Development Strategy
PSEF	Photovoltaic Solar Energy Facility
PV	Photovoltaic
PVSEF	Photovoltaic solar energy facility
RBS	Revised Balanced Scenario
SDF	Spatial Development Framework
SIA	Social Impact Assessment
UNFCCC	United Nations Framework Convention on Climate Change
XDM	Xhariep District Municipality

SECTION 1: INTRODUCTION

1.1 INTRODUCTION

The CSIR was appointed by Solairedirect as the lead consultant to manage the Environmental Impact Assessment (EIA) process for the establishment of the proposed Valleydora photovoltaic solar energy facility (PVSEF) and associated infrastructure on on Remainder of the Farm Knapdaar, Nr. 14; Remainder of the Farm Kuilfontein, Nr.195; and Remainder of the Farm Hermanus Rust, Nr. 206, approximately 140 km south-west of in the Free State Province, South Africa (Figure 1.1).

Tony Barbour was appointed by the CSIR to undertake a specialist Social Impact Assessment (SIA) as part of the EIA process. The terms of reference for the study include a scoping level assessment to identify key social issues that would need to be addressed as part of the EIA. This report contains the findings of the initial scoping level social assessment undertaken as part of the EIA process.

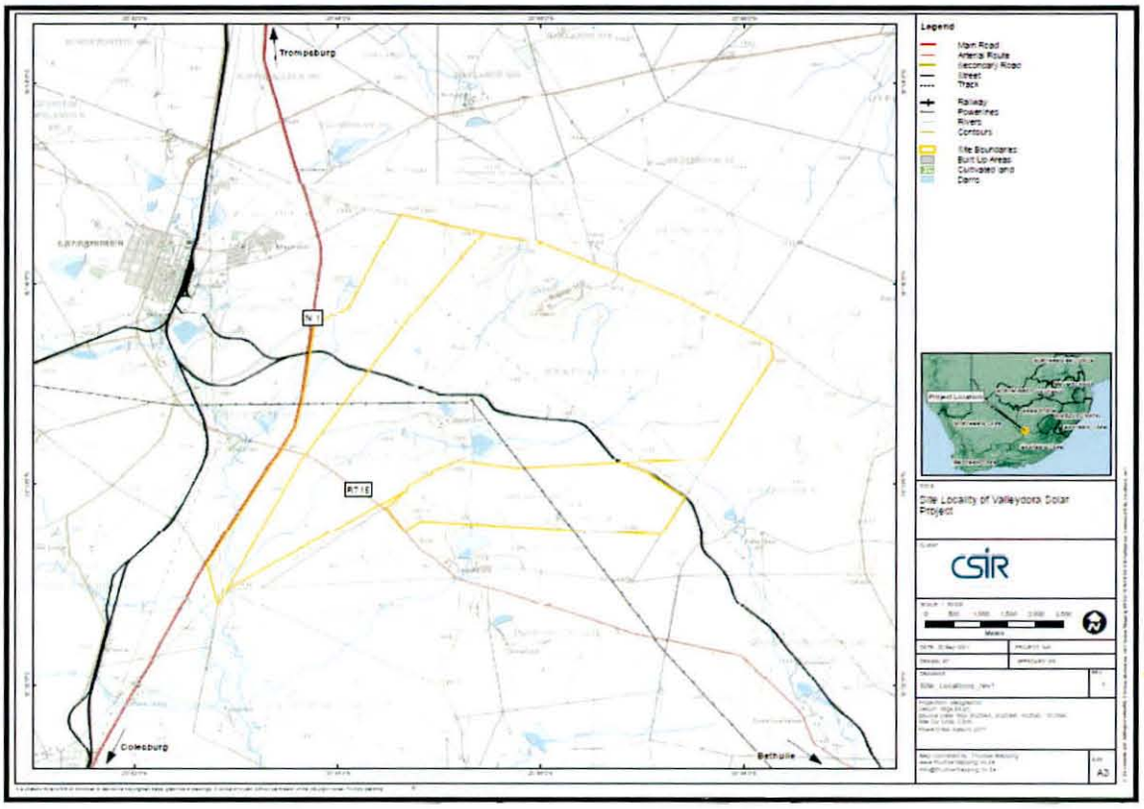

Figure 1.1: Location of Valleydora PVSEF

1.2 TERMS OF REFERENCE

The terms of reference for the Scoping Report Assessment include:

- A description of the environment that may be affected by the proposed activity and the manner in which the environment may be affected by the proposed facility;
- A description of the potential social issues associated with the proposed facility; and
- A description of the approach proposed for assessing the potentially significant issues that will be addressed by the SIA in the EIA phase.

1.3 PROJECT DESCRIPTION

Solairedirect has identified the potential to establish a new PVSEF with a generation capacity of 75 MW in the Kopanong Local Municipality (KLM), in the Free State Province of South Africa. Photograph 1.1 illustrates a typical PVSEF facility. The proposed site is located on Remainder of the Farm Knapdaar, Nr. 14; Remainder of the Farm Kuilfontein, Nr.195; and Remainder of the Farm Hermanus Rust, Nr. 206, approximately 140 km south-west of the town of Bloemfontein.

The total footprint of the project would be approximately 150 hectares (including supporting infrastructure on site), and the project will have an expected minimum lifespan of 20 years. The exact number and placement of photovoltaic cells will be investigated in more detail during the EIA phase of the study. The energy will be linked via an on-site substation to the Eskom grid. The project is therefore an Independent Power Producer (IPP) project.

Source: www.wapa.gov

Photograph 1.1: Photovoltaic array

Photovoltaic technology uses the energy from the sun to generate electricity through a process known as the Photovoltaic Effect. Simply speaking, this refers to light knocking electrons into a higher state of energy to create electricity, best illustrated by the small photovoltaic cell on hand held solar calculators. A photovoltaic array typically consists of the following components:

Photovoltaic Cells
Silicon wafers which are the building blocks, act as semiconductors and when struck by light produce electricity. Individual photovoltaic cells are linked in circuit and placed