

PALAEONTOLOGICAL DESKTOP REPORT

PROPOSED POTFONTEIN PHOTOVOLTAIC FACILITY

***Potfontein Photovoltaic Facility, Farm: Koens Draai 36,
Emthanjeni Local Municipality, Pixley ka Seme District Municipality,
Northern Cape Province of South Africa***

Developer: SCATEC SOLAR SA (PTY) LTD

29 April 2013

By:

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EXECUTIVE SUMMARY

The development of a Photovoltaic (PV) Facility near Potfontein in the Northern Cape is an initiative of Scatec Solar SA (Pty) Ltd. This report forms part of the Heritage Impact Assessment and was requested by Scatec Solar SA (Pty) Ltd. The purpose of this Palaeontological Desktop Survey is to identify potential palaeontological heritage on the site of the proposed development, to assess the impact the development may have on this resource and to make recommendations as to how this impact might be mitigated.

This report forms part of the Environmental Impact Assessment for the Potfontein Photovoltaic (PV) Facility and complies with the requirements for the South African National Heritage Resource Act No 25 of 1999. In accordance with Section 38 (Heritage Resources Management), a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint.

Scatec Solar SA (Pty) Ltd plans to develop a photovoltaic electricity generation facility on the remainder of Portion 5 (Koens Draai East) of the Farm Koens Draai East No. 36, De Aar, Northern Cape, located on the Eastern side of the R388 road approximately 5km North of Potfontein Station and approximately 60km north of De Aar in the Northern Cape. The installation's footprint is approximately 271,683ha.

A basic assessment of the topography and geology of the area was made by using the appropriate geological 1:250 000 map (3024 Colesberg) in conjunction with Google Earth.

The study area is underlain by Late Cretaceous to Quaternary calcrete and alluvial deposits. The Quaternary deposits consist mainly of fluvial gravels, aeolian sands, lacustrine and pan mudrocks.

The palaeontology of the Quaternary calcretes is poorly studied and fossil material collected is mainly associated with ancient pans, lakes and river systems. Fossil heritage associated with these deposits include: the remains of numerous terrestrial and freshwater shelled organisms, root structures, burrow casts and rare vertebrate remains as well as some microscopic fossils and stromatolite structures in the limestones. No fossils have as yet been described from the alluvial deposits in this part of South Africa.

There is a medium to low potential for fossil material to be uncovered during excavations and the site therefore has a medium to low palaeontological sensitivity rating.

It is recommended that the developer and ECO are made aware of the possibility of exposing rare fossils in freshly excavated calcretes. If fossils of any kind are exposed during excavations, a trained palaeontologist must be informed and the fossils recorded and collected according to SAHRA specifications.

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1. INTRODUCTION

The development of a Photovoltaic (PV) Facility near Potfontein in the Northern Cape is an initiative of Scatec Solar SA (Pty) Ltd. This report forms part of the Heritage Impact Assessment and was requested by Scatec Solar SA (Pty) Ltd. The purpose of this Palaeontological Desktop Survey is to identify potential palaeontological heritage on the site of the proposed development, to assess the impact the development may have on this resource and to make recommendations as to how this impact might be mitigated.

1.1. Legal Requirements

This report forms part of the Environmental Impact Assessment for the Potfontein Photovoltaic (PV) Facility and complies with the requirements for the South African National Heritage Resource Act No 25 of 1999. In accordance with Section 38 (Heritage Resources Management), a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act, and which therefore fall under its protection, include:

- geological sites of scientific or cultural importance;
- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens; and
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

2. PROPOSED DEVELOPMENT DESCRIPTION

Scatec Solar SA (Pty) Ltd, an international renewable energy generator that develops, finances, builds, operates and maintains commercial alternative energy generation facilities, plans to develop a photovoltaic electricity generation facility on the remainder of Portion 5 (Koens Draai East) of the Farm Koens Draai East No. 36, De Aar, Northern Cape, located on the Eastern side of the R388 road approximately 5km North of Potfontein Station and approximately 60km north of De Aar in the Northern Cape (Figure 2.1). The installation's footprint is approximately 271,683ha.

An individual PV module is made of layers of amorphous silicone, which acts as a semi-conductor. When light shines on the cell it creates an electric field across the layers, causing electricity to flow. Higher light intensity will increase the flow of electricity. This charge is discharged via the module's transparent conductive front layer and metallic rear layer. The direct current generated within the module is fed into the electrical grid via an inverter.



Figure 2.1 Location of the proposed Potfontein photovoltaic facility

3. AIMS AND METHODS

Gideon Groenewald was commissioned by Scatec Solar SA (Pty) Ltd to do a Palaeontological Desktop Survey. Following the “SAHRA APM Guidelines: Minimum Standards for the Archaeological & Palaeontological Components of Impact Assessment Reports” the aims of the Palaeontological desktop Survey are:

1. to investigate available resources (geological maps, scientific literature, previous impact assessment reports, institutional fossil collections, satellite images or aerial photos , etc) to inform an assessment of fossil heritage and/or exposure of potentially fossiliferous rocks within the study area;
2. to conclude whether a further field assessment is warranted or not; and
3. where further studies are required, this desktop survey report would normally be an integral part of a field assessment of relevant palaeontological resources.

A basic assessment of the topography and geology of the area was made by using the appropriate geological 1:250 000 map (3024 Colesberg) in conjunction with Google Earth. The only limitation on this methodology is the scale of mapping, which restricts comparison of the geology to the 1:250 000 scale. This restriction only applies in areas where major changes in the geological character of the area occur over very short distances or on the geological transformation zones.

A review of the literature on the geological formations exposed at surface in the development site and the fossils that have been associated with these geological strata was undertaken.

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 3.1 below.

Table 3.1 Palaeontological Sensitivity Analysis Outcome Classification

Sensitivity	Description
Low Sensitivity	Areas where a negligible impact on the fossil heritage is likely. This category is reserved largely for areas underlain by igneous rocks. However, development in fossil bearing strata with shallow excavations or with deep soils or weathered bedrock can also form part of this category.
Moderate Sensitivity	Areas where fossil bearing rock units are present but fossil finds are localised or within thin or scattered sub-units. Pending the nature and scale of the proposed development the chances of finding fossils are moderate. A field-based assessment by a professional palaeontologist is usually warranted.
High Sensitivity	Areas where fossil bearing rock units are present with a very high possibility of finding fossils of a specific assemblage zone. Fossils will most probably be present in all outcrops and the chances of finding fossils during a field-based assessment by a professional palaeontologist are very high. Palaeontological mitigation measures need to be incorporated into the Environmental Management Plan

4. GEOLOGY OF THE AREA

The study area is underlain by Late Cretaceous to Quaternary calcrete and alluvial deposits (Figure 4.1). The Quaternary deposits consist mainly of fluvial gravels, aeolian sands, lacustrine and pan mudrocks.

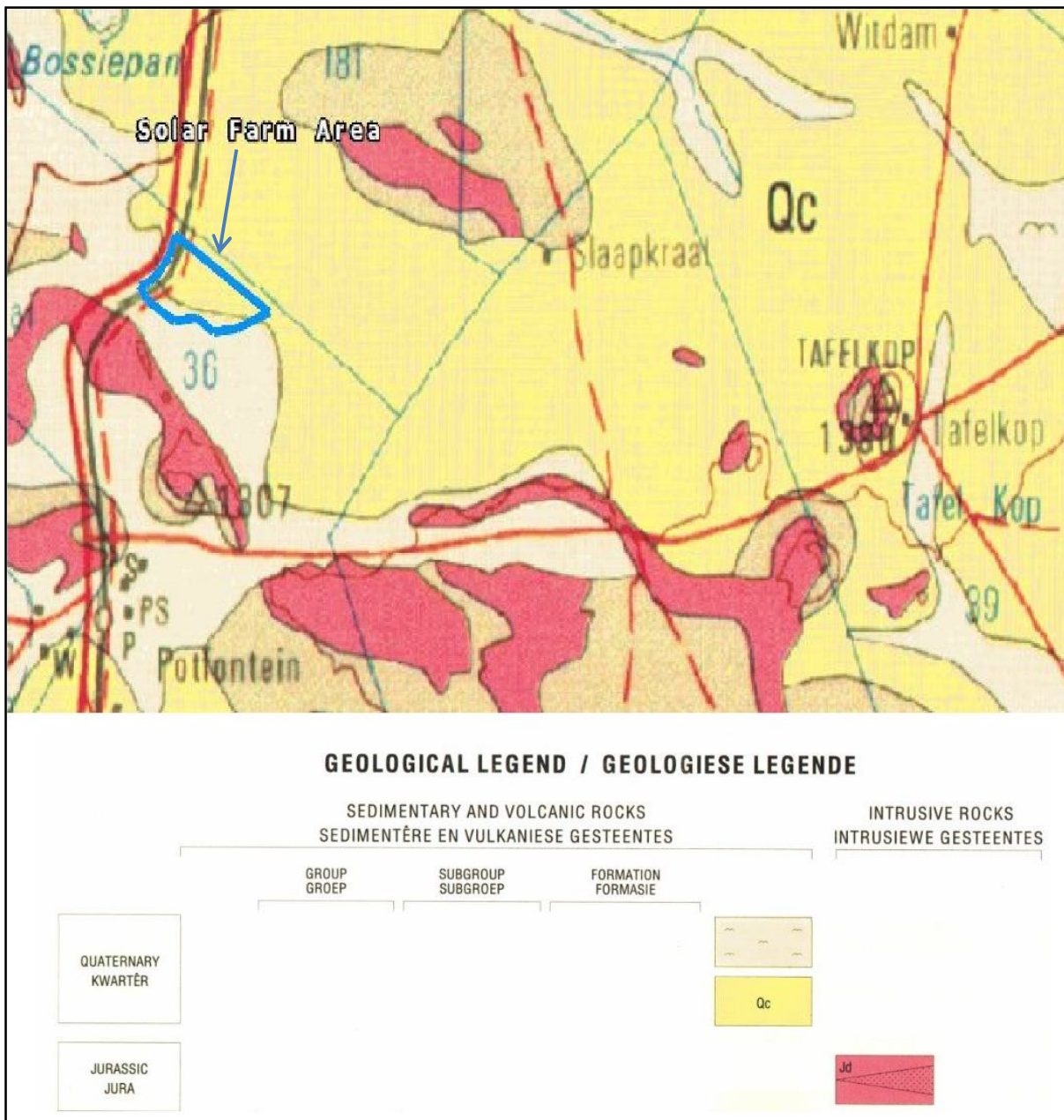


Figure 4.1 Geology of the study area

5. PALAEOONTOLOGY OF THE STUDY AREA

The palaeontology of the Quaternary calcretes is poorly studied and fossil material collected is mainly associated with ancient pans, lakes and river systems (Almond & Pether, 2009). Fossil heritage associated with these deposits include: the remains of numerous terrestrial and freshwater shelled organisms, root structures, burrow casts and rare vertebrate remains as well as some microscopic fossils and stromatolite structures in the limestones.

No fossils have as yet been described from the alluvial deposits in this part of South Africa.

The excavations for the foundations of the PV supporting structures as well as the roads and other infrastructure may provide an opportunity to inspect fresh, unweathered calcrete rock in the study area.

6. PALAEOLOGICAL SIGNIFICANCE

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged. The expected palaeontological significance is summarised in Table 6.1 (Almond & Pether, 2009).

Table 6.1 Palaeontological Significance of Geological Units on Site

Geological Unit	Rock Type and Age	Fossil Heritage	Palaeontological Sensitivity
Quaternary Calcrete	Fluvial gravels, sands, lacustrine and pan mudrocks, evaporites, aeolian sands, pedocretes (especially calcrete) LATE CRETACEOUS TO RECENT	Palynomorphs, root casts (rhizomorphs) and burrows (e.g. termitaria), rare vertebrate remains (mammals, fish, ostrich egg shell etc), diatom-rich limestones, freshwater stromatolites, freshwater and terrestrial shells (gastropods, bivalves), ostracods, charophytes.	Medium sensitivity
Alluvium	Alluvium RECENT	None as yet	Low sensitivity

There is a possibility that fossils could be encountered during excavations within the development footprint, especially if fresh calcrete deposits are exposed. The study area therefore has a medium to low palaeosensitivity (Figure 6.1)

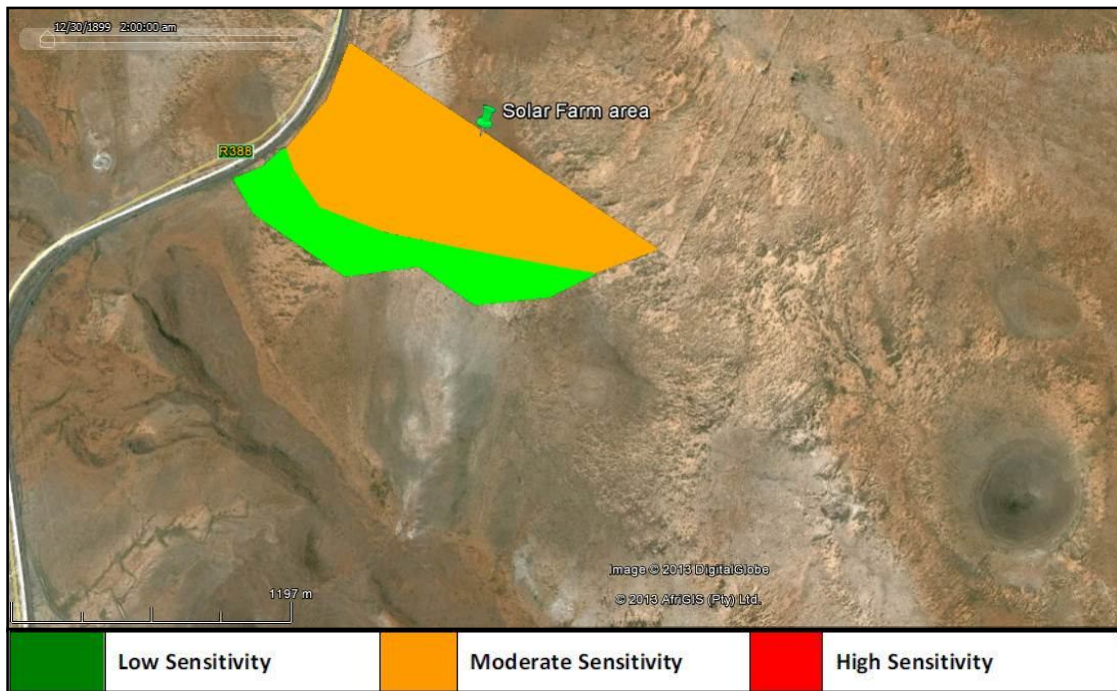


Figure 6.1 Palaeosensitivity of the study area

7. CONCLUSION AND RECOMMENDATION

The development site for the Potfontein Photovoltaic Facility is underlain by Late Cretaceous to Quaternary calcrete and alluvium deposits. There is a medium to low potential for fossil material to be uncovered during excavations and the site therefore has a medium to low palaeontological sensitivity rating.

It is recommended that the developer and ECO are made aware of the possibility of exposing rare fossils in freshly excavated calcretes. If fossils of any kind are exposed during excavations, a trained palaeontologist must be informed and the fossils recorded and collected according to SAHRA specifications.

8. REFERENCES

Almond J and Pether J, 2009. Palaeontological Heritage of the Northern Cape. SAHRA Palaeontological Report. Capetown.

9. QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Dr Gideon Groenewald has a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technicon RSA (the University of South Africa) (1989). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeoecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

10. DECLARATION OF INDEPENDENCE

I, Gideon Groenewald, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.

A handwritten signature in dark ink, appearing to read 'Gideon Groenewald', with a stylized flourish at the end.

Dr Gideon Groenewald
Geologist