PALAEONTOLOGICAL HERITAGE ASSESSMENT: COMBINED DESKTOP & FIELD-BASED STUDY

Proposed Sonbesie Solar Power Plant on the Remaining Extent of Farm Retreat 671 near Vryburg, North-West Province

John E. Almond PhD (Cantab.)
***Natura Viva* cc, PO Box 12410 Mill Street,**
Cape Town 8010, RSA
naturaviva@universe.co.za

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EXECUTIVE SUMMARY

The company Sonbesie Solar Power Plant (RF) (Pty) Ltd is proposing to develop up to 115MW photovoltaic solar facility, known as the Sonbesie Solar Power Plant, on the Remaining Extent of Farm Retreat 671, IN Registration Division, Province of the North-West.

The Sonbesie Solar Power Plant study area is underlain at depth by late Archaean (*c*. 2.6 billion year-old) sedimentary rocks of the Schmidtsdrif Subgroup (Ghaap Group, Transvaal Supergroup) and possibly also by Dwyka Group glacial rocks. These ancient bedrocks are entirely mantled by much younger, Late Caenozoic calcrete hardpans, sandy soils of possible aeolian origin and relict alluvial gravels related to the Dröe Harts River.

No fossil remains were recorded from the surface rocks during field assessment and it is inferred that they are of low palaeontological sensitivity. It is concluded that, with or without mitigation, the overall impact of the proposed Sonbesie Solar Power Plant on Farm Retreat 671 is of **NEGATIVE LOW SIGNIFICANCE** in palaeontological heritage terms.

Should significant fossil remains - such as well-preserved stromatolites or mammal bones and teeth - be exposed during construction, the responsible Environmental Control Officer should safeguard these, preferably *in situ*. The South African Heritage Resources Authority (SAHRA) should be alerted as soon as possible (Contact details: Mrs Colette Scheermeyer, P.O. Box 4637, Cape Town 8000, Tel: 021 462 4502, Email: cscheermeyer@sahra.org.za), so that appropriate action can be taken by a professional palaeontologist, at the developer's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (*e.g.* stratigraphy, sedimentology, taphonomy) by a professional palaeontologist. The palaeontologist concerned with mitigation work will need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (*e.g.* museum or university collection). These recommendations should be included within the EMPr for the proposed solar power plant development.

There are no fatal flaws in the proposed solar power plant development, nor are there objections to its authorisation as far as fossil heritage conservation is concerned, *provided* that the mitigation recommendations outlined above are fully complied with. The no-go option (no solar development) will have a neutral impact on local palaeontological heritage resources.

1. INTRODUCTION & BRIEF

The company Sonbesie Solar Power Plant (RF) (Pty) Ltd is proposing to develop up to 115MW photovoltaic solar facility, known as the Sonbesie Solar Power Plant on the Remaining Extent of Farm Retreat 671, IN Registration Division, Province of the North-West. The land parcel measures 297,4480 hectares in area and is situated approximately 7 km southwest of the town of Vryburg, Naledi Local Municipality, North-West Province. The footprint of the proposed alternative energy project will be approximately 264 hectares (including supporting infrastructure).

The study site is situated on flat lying terrain on the north-eastern side of Farm Retreat 671 which lies on the western side of the N18 tar road between Vryburg and Kimberley. The location of the study area is shown on the map Fig. 1 and a satellite image of the area is shown in Fig. 2.

The proposed solar energy facility overlies potentially fossiliferous sediments of Late Caenozoic age. Fossils preserved within the bedrock or superficial deposits may be disturbed, damaged or destroyed during the construction phase of the proposed project. The extent of the proposed development (over 5000 m^2) falls within the requirements for a Heritage Impact Assessment (HIA) as required by Section 38 (Heritage Resources Management) of the South African Heritage Resources Act (Act No. 25 of 1999).

The present combined desktop and field-based palaeontological study has accordingly been commissioned on behalf of the client by Sonbesie Solar Power Plant (RF) (Pty) Ltd (Contact details: Mr D.P.S. Berlijn**,** Managing Director. Phone: +27 10 500 3680. Mobile: +27742 488 488. Fax: +27 862 731 614. Address: 2nd Floor West Tower, Nelson Mandela Square, Maude Street, Sandown. PO Box 785553, Sandton, 2146, RSA).

The Terms of Reference for this palaeontological study, as defined by Sonbesie Solar Power Plant (RF) (Pty) Ltd, are as follows:

- A desktop investigation of the area, in which all geological maps, published scientific literature, previous paleontological impact studies in the same region and the author's field of experience (consultation with professional colleagues as well as examination of institutional fossil collections and data) should be studied and used.

- Based on the outcome of the desktop study and the comments obtained from SAHRA, the need for a field assessment must be determined. The desktop investigation must be supplemented with a field assessment if required.

- Assess the potential impacts, based on a supplied methodology.

- Describe mitigation measures to address impacts during the construction, operation and decommissioning stages.

- Develop a protocol for any paleontological finds.

- Describe cumulative impacts of the project on paleontological resources in both the local study area, regional study area and the proponent's plans to manage those effects.

- Supply the client with geo-referenced GIS shape files of any sensitive areas.

1.1. Legislative context of this palaeontological study

The various categories of heritage resources recognised as part of the National Estate in Section 3 of the National Heritage Resources Act (1999) include, among others:

- geological sites of scientific or cultural importance;
- palaeontological sites;
- palaeontological objects and material, meteorites and rare geological specimens.

According to Section 35 of the National Heritage Resources Act, dealing with archaeology, palaeontology and meteorites:
(1) The protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority.
(2) All archaeological objects, palaeontological material and meteorites are the property of the State.
(3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.
(4) No person may, without a permit issued by the responsible heritage resources authority—
(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.
(5) When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—
(a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
(b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
(c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph *(a)* to apply for a permit as required in subsection (4); and
(d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

Minimum standards for the palaeontological component of heritage impact assessment reports have been developed by SAHRA (2013).

2. APPROACH TO THE PALAEONTOLOGICAL HERITAGE ASSESSMENT

The information used in this desktop study was based on the following:

1. A short project outline and maps provided by Sonbesie Solar Power Plant (RF) (Pty) Ltd;

2. A review of the relevant scientific literature, including published geological maps, satellite images, and previous fossil heritage assessments in the region (*e.g.* Almond 2013a, 2013b, 2013c);

3. A short site visit by the author and one assistant on 14 January 2016.

4. The author's database on the formations concerned and their palaeontological heritage.

In preparing a palaeontological desktop study the potentially fossiliferous rock units (groups, formations *etc*) represented within the study area are determined from geological maps and satellite images. The known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region, and the author's field experience (Consultation with professional colleagues as well as examination of institutional fossil collections may play a role here, or later following field assessment during the compilation of the final report). This data is then used to assess the palaeontological sensitivity of each rock unit to development. The potential impact of the proposed development on local fossil heritage is then determined on the basis of (1) the palaeontological sensitivity of the rock units concerned and (2) the nature and scale of the development itself, most significantly the extent of fresh bedrock excavation envisaged. When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a Phase 1 field assessment study by a professional palaeontologist is usually warranted to identify any palaeontological hotspots and make specific recommendations for any mitigation required before or during the construction phase of the development.

On the basis of the desktop and Phase 1 field assessment studies, the likely impact of the proposed development on local fossil heritage and any need for specialist mitigation are then determined. Adverse palaeontological impacts normally occur during the construction rather than the operational or decommissioning phase. Phase 2 mitigation by a professional palaeontologist – normally involving the recording and sampling of fossil material and associated geological information (*e.g.* sedimentological data) may be required (a) in the pre-construction phase where important fossils are already exposed at or near the land surface and / or (b) during the construction phase when fresh fossiliferous bedrock has been exposed by excavations. To carry out mitigation, the palaeontologist involved will need to apply for a palaeontological collection permit from the relevant heritage management authority, *i.e.* The South African Heritage Resources Authority (SAHRA) (Contact details: Mrs Colette Scheermeyer, P.O. Box 4637, Cape Town 8000, Tel: 021 462 4502, Email: cscheermeyer@sahra.org.za). It should be emphasized that, *providing appropriate mitigation is carried out*, the majority of developments involving bedrock excavation can make a *positive* contribution to our understanding of local palaeontological heritage.

2.1. Assumptions & limitations

The accuracy and reliability of palaeontological specialist studies as components of heritage impact assessments are generally limited by the following constraints:

1. Inadequate database for fossil heritage for much of the RSA, given the large size of the country and the small number of professional palaeontologists carrying out fieldwork here. Most development study areas have never been surveyed by a palaeontologist.

2. Variable accuracy of geological maps which underpin these desktop studies. For large areas of terrain these maps are largely based on aerial photographs alone, without ground-truthing. The maps generally depict only significant ("mappable") bedrock units as well as major areas of superficial "drift" deposits (alluvium, colluvium) but for most regions give little or no idea of the level of bedrock outcrop, depth of superficial cover (soil *etc*), degree of bedrock weathering or levels of small-scale tectonic deformation, such as cleavage. All of these factors may have a major influence on the impact significance of a given development on fossil heritage and can only be reliably assessed in the field.

3. Inadequate sheet explanations for geological maps, with little or no attention paid to palaeontological issues in many cases, including poor locality information;

4. The extensive relevant palaeontological "grey literature" - in the form of unpublished university theses, impact studies and other reports (*e.g*. of commercial mining companies) - that is not readily available for desktop studies;

5. Absence of a comprehensive computerized database of fossil collections in major RSA institutions which can be consulted for impact studies. A Karoo fossil vertebrate database is now accessible for impact study work.

In the case of palaeontological desktop studies without supporting Phase 1 field assessments these limitations may variously lead to either:

(a) *underestimation* of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or

(b) *overestimation* of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by tectonism or weathering, or are buried beneath a thick mantle of unfossiliferous "drift" (soil, alluvium *etc*).

Since most areas of the RSA have not been studied palaeontologically, a palaeontological desktop study usually entails *inferring* the presence of buried fossil heritage within the study area from relevant fossil data collected from similar or the same rock units elsewhere, sometimes at localities far away. Where substantial exposures of bedrocks or potentially fossiliferous superficial sediments are present in the study area, the reliability of a palaeontological impact assessment may be significantly enhanced through field assessment by a professional palaeontologist.

In the case of the present project area near Vryburg the main limitation for fossil heritage assessment is the generally low level of Precambrian and Palaeozoic bedrock exposure due to extensive cover by largely unfossiliferous superficial sediments as well as the limited access to much of the study area because of the sparse road network. Adverse weather conditions (heavy thunderstorms) hampered fieldwork outside the vehicle during the site visit. However, confidence levels regarding the conclusions drawn following palaeontological field assessment are moderately good.

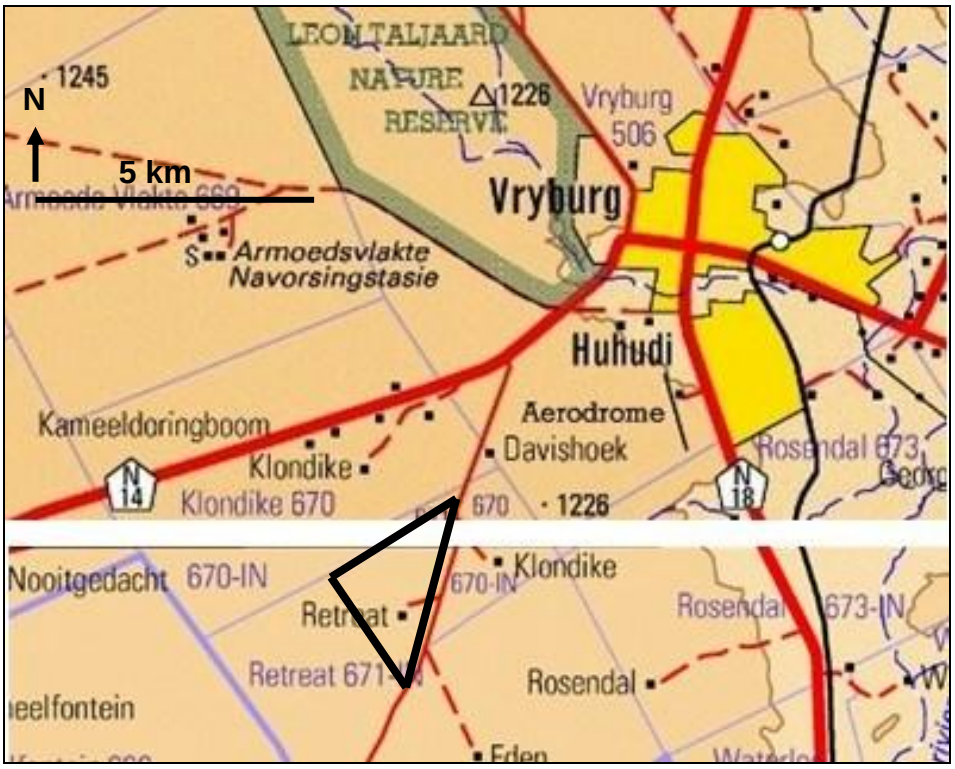

Fig. 1. Extracts from the adjoining 1: 250 000 topographical maps 2624 Vryburg and 2724 Christiana (Courtesy of the Chief Directorate National Geo-spatial Information, Mowbray) showing the location of the proposed Sonbesie Solar Power Plant study area on the Remaining Extent of Farm Retreat 671, some 7 km southwest of Vryburg, North-West Province (black polygon).

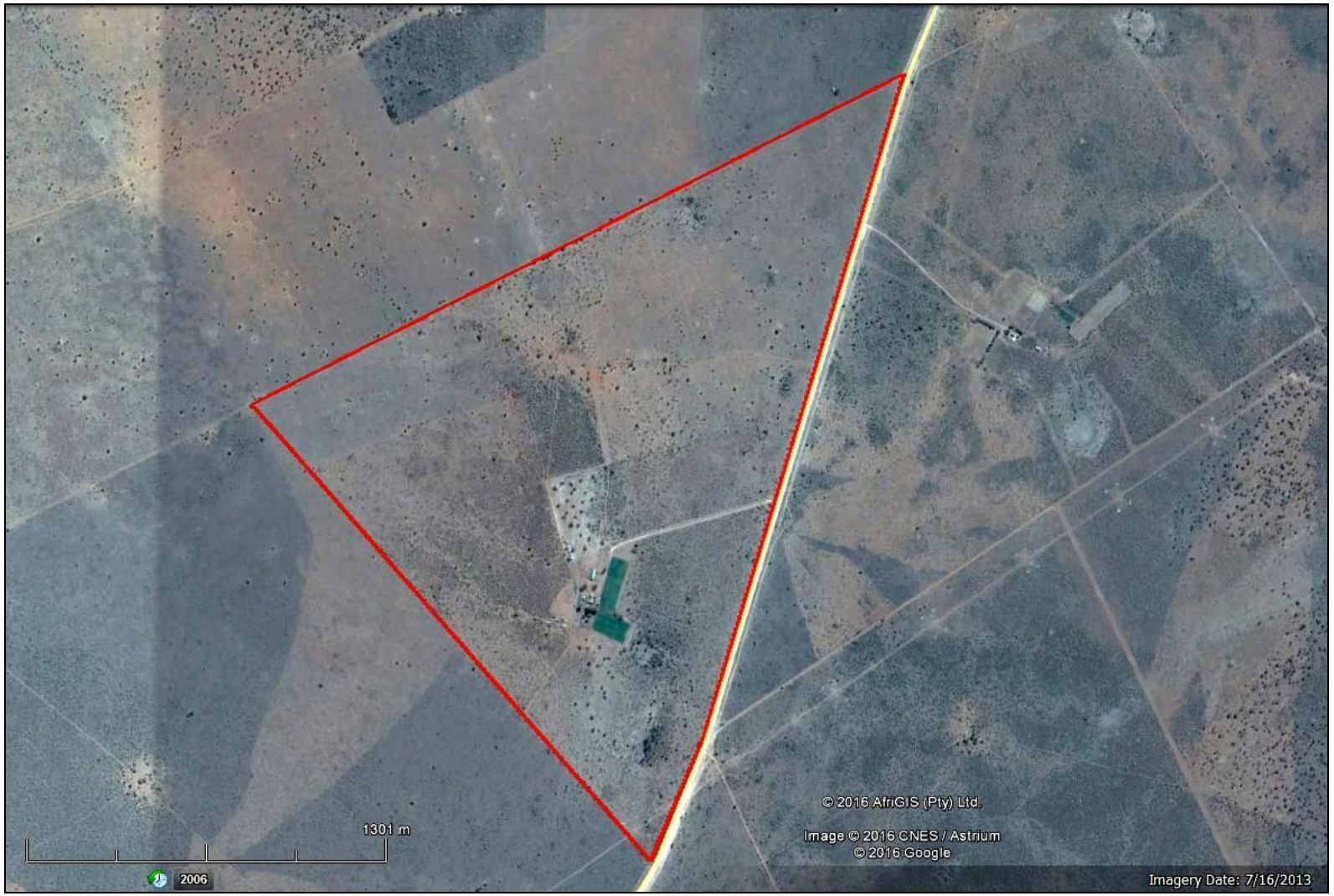

Fig. 2. Google earth© satellite image of the Sonbesie Solar Power Plant study area on the Remaining Extent of the Farm Retreat 671 to the southwest of Vryburg, North-West Province (red polygon).

3. GEOLOGICAL & PALAEONTOLOGICAL BACKGROUND

The triangular Sonbesie Solar Power Plant study area on the Remaining Extent of Farm Retreat 671 near Vryburg consists of typical flat-lying terrain of the Ghaap Plateau region at an elevation of *c*. 1230 – 1245 m amsl that is currently used for agricultural purposes (principally cattle farming) (Figs. 3 & 4). The climate is semi-arid and the dense vegetation cover of grassy thornveld is mapped as Ghaap Plateau Vaalbosveld. There are several small to large pans, often associated with substantial calcrete deposits (grey on satellite images, Fig. 2), within or just outside the study area. Bedrock exposure within the study area is more or less non-existent due to extensive cover by superficial deposits such as sandy soils and calcrete.

The geology of the study area to the southwest of Vryburg is shown on the adjoining 1: 250 000 geology maps 2624 Vryburg and 2724 Christiana (Council for Geoscience, Pretoria; Fig. 5 herein). An explanation for the Vryburg geological map has been published by Keyser & Du Plessis (1993) and that for the adjoining Christiana sheet 2724 to the south by Schutte (1994). The entire study area is underlain *at depth* by ancient sedimentary rocks of the **Schmidtsdrif Subgroup** that are almost flat-lying in this area. This is the basal subdivision of the Late Archaean to Early Proterozoic **Ghaap Group** (**Transvaal Supergroup**) in the Griqualand West Basin, Ghaap Plateau Subbasin. Useful reviews of the stratigraphy and sedimentology of these Transvaal Supergroup rocks have been given by Moore *et al.* (2001), Eriksson and Altermann (1998) as well as Eriksson *et al.* (1993, 1995, 2006). The Ghaap Group represents some 200 Ma of chemical sedimentation - notably iron and manganese ores, cherts and carbonates with subordinate siliclastic rocks - within the Griqualand West Basin that was situated towards the western edge of the Kaapvaal Craton (See fig. 4.19 in McCarthy & Rubidge 2005).

The Schmidtsdrif Subgroup sediments (and possible Permo-Carboniferous glacial deposits of the **Dwyka Group** overlying them) are not exposed at surface within the Sonbesie Solar Power Plant study area due to the pervasive cover by Late Caenozoic superficial sediments. These include Tertiary (Neogene) to Quaternary **calcrete hardpans** in the west (T-Qc in Fig. 5) and **alluvial gravels** of probable Quaternary age in the east (Qa in Fig. 5).

Calcrete occurs widely in the Vryburg area, especially overlying the Ventersdorp, Boomplaas and Dwyka outcrop areas, notably in association with ancient drainage lines and pans. The most extensive calcrete deposits occur on the south-western side of pans as a consequence of the prevailing northwest winds (Keyser & Du Plessis 1993). Schutte (1994) notes that terraces of well-indurated calcrete occur in the valley of the Dröe Harts River some 30 south of the present study area. The calcretes there contain rounded clasts of various rock types that have a probable Dwyka provenance. Calcretes on the farm Rosendal immediately to the east of the Retreat study area contain embedded “palaeolithic stone tools” indicating a Quaternary or younger age for these deposits.

River terrace gravels in the Vryburg area are typically dominated by clasts of brown quartzite that are probably derived from the Vryburg Formation (Keyser & Du Plessis 1993, Schutte 1994). They also contain agates from the Ventersdorp lavas and sometimes diamonds too.

Fig. 3. Near-surface calcrete hard pan and calcrete surface rubble overlain by pale brown soils as typically seen in the western portion of the study area.

Fig. 4. Flat terrain with Kalahari thornveld and orange-brown sandy soils (probably aeolian sands in part) in the northern portion of the study area.

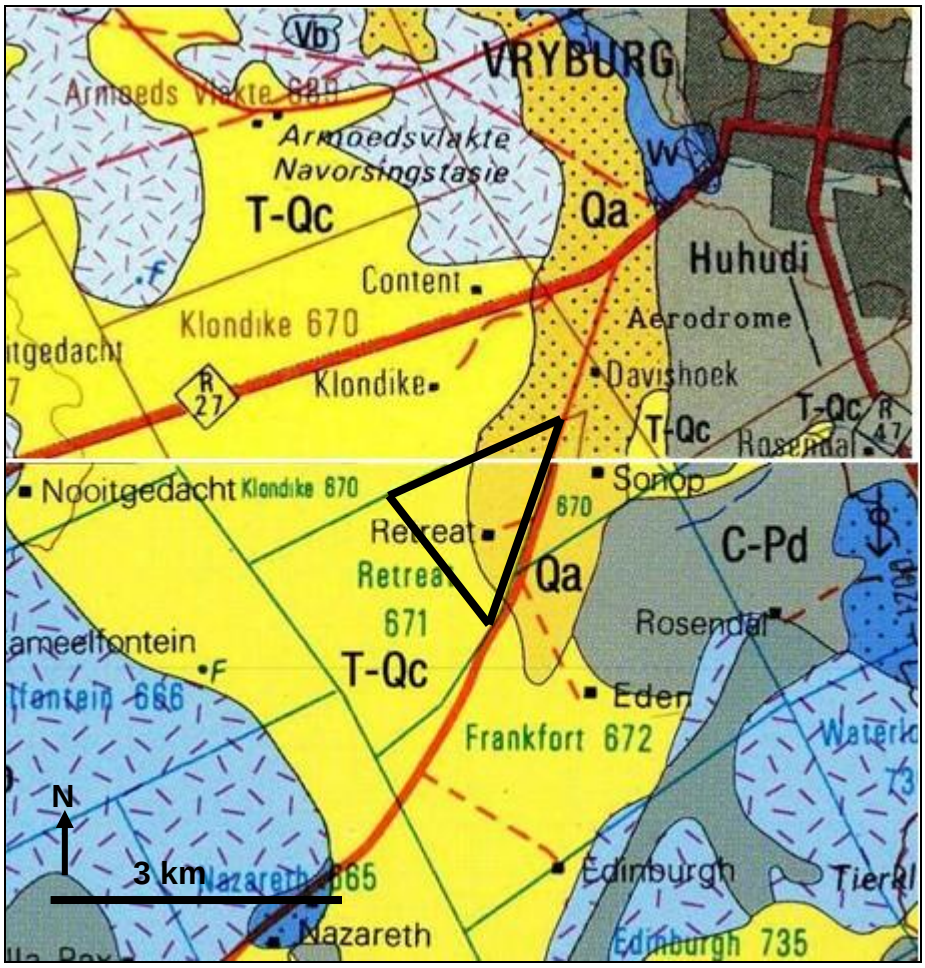

Fig. 5. Extract from the adjoining 1: 250 000 geological maps 2624 Vryburg and 2724 Christiana (Council for Geoscience, Pretoria) showing the outline of the study area for the proposed Sonbesie Solar Power Plant study area on the Remaining Extent of the Farm Retreat 671, some 6.5 km southwest of Vryburg (black polygon). The main geological units represented mapped the broader study region include:

Vryburg Formation (Vv, middle and dark blue) – late Archaean fluvial and shallow marine quartzites, mudrocks, conglomerates with two intervals of andesitic volcanics (stippled)

Boomplaas Formation (Vb, pale & middle blue with dashes) – late Archaean dolomites (locally stromatolitic or oolitic) interbedded with siliciclastics (quartzite, shale, flagstone)

Clearwater Formation (Vc, dark grey) – late Archaean mudrocks with interbedded dolomites, flagstones, tuffites, cherts

Dwyka Group (C-Pd, middle grey) – Permocarboniferous glacial sediments (tillites, interglacial mudrocks)

Calcrete (T-Qc, middle yellow) – Late Caenozoic calcrete hardpans

Alluvial gravels (Qa, dark yellow with or without stipple) – Quaternary relict or high level gravels

4. FIELD OBSERVATIONS ON FARM RETREAT 671

Fieldwork concentrated on examining fresh exposures of any terrace gravels and calcrete hardpans for fossil material since no bedrock exposures were encountered. GPS data for localities visited are listed in the Appendix.

4.1. Superficial sediments

Much of the study area is mantled in pale orange-brown sandy soils, probably in part of aeolian origin on the margins of the Kalahari Basin, with sparse surface gravels of calcrete, ferricrete and quartzite (Fig. 4).

Thick creamy to pale greyish-green or rusty brown calcrete deposits overlain by pale brown calcareous soils are exposed in the extensive disturbed area to the north of the farmstead (Fig. 3). The calcrete is composite, showing multiple phases of carbonate precipitation and erosion, and contains dispersed cobbles of probable Vryburg Formation quartzites, grey Boomplaas Formation limestone as well as amygdaloidal Ventersdorp lavas and possible exotic clasts of Dwyka Group provenance (Fig. 6). Low oucrops of karstified, dense, blue-grey calcrete are seen in the vicinity of and just south of the homestead (Fig. 7). No fossil material (*e.g.* land snails) was observed within the calcrete deposits.

Pebbly to cobbly alluvial gravels observed in the north-eastern corner of the study area are mainly composed of moderately rounded clasts of brown-weathering medium- to coarse-grained quartzite, probably derived from the Vryburg Formation (Fig. 9). Downwasted quartzite gravels (with occasional crudely-flaked stone artefacts among them) as well as calcrete surface rubble were also observed around the margins of a small pan (Fig. 8). The high degree of rounding indicates fluvial input, probably associated with the Dröe Harts drainage system. No fossil bones or teeth were found in association with the fluvial gravels or pan sediments on Retreat 671.

Fig. 6. Close-up of creamy-hued calcrete blocks showing sparse enclosed gravel clasts (Hammer = 30 cm).

Fig. 7. Partial exposure of very dense, blue-grey veined calcrete just south of the homestead.

Fig. 8. Pebbly alluvial gravels (mainly quartzite) and calcrete rubble on the margins of a small pan.

Fig. 9. Coarse, subrounded alluvial gravels of brown-weathering quartzite in the north-eastern portion of the study area (Hammer = 30 cm).

5. SIGNIFICANCE OF POTENTIAL IMPACTS ON PALAEONTOLOGICAL HERITAGE

A brief assessment of the impact significance of the construction phase of the proposed Sonbesie Solar Power Plant on local fossil heritage resources in the study area on Farm Retreat 671 is presented here. Please note that further impacts are not anticipated during the operational and decommissioning phase of the development.

- **Nature of the impact**

Bedrock excavations and site clearance for the proposed PV panels, control building, any buried cables, the electrical substation as well as the internal site roads and powerline infrastructure may adversely affect potential fossil heritage within the study area by damaging, destroying, disturbing or permanently sealing-in fossils at or below the ground surface that are then no longer available for scientific research or other public good.

- **Geographical extent and duration of the impact**

Any significant impacts on fossil heritage are limited to the development site and to the construction phase when site clearance and excavations into fresh, potentially fossiliferous bedrock may take place. No further significant impacts are anticipated during the operational or decommissioning phases of the solar facility. Impacts on fossil heritage are generally permanent.

- **Probability of the impact occurring**

No fossil heritage resources were observed within the sedimentary rocks exposed within the study area during the field assessment. The probability of significant impacts on palaeontological heritage during the construction phase is therefore very low.

- **Intensity / magnitude of impact**

Given the apparent absence of fossil-rich bedrocks in the study area, the magnitude of impacts on palaeontlogical heritage is rated as very low.

- **Degree to which the impact can be reversed**

Impacts on fossil heritage are generally irreversible. Well-documented new records and further palaeontological studies of any fossils revealed during construction would represent a positive impact from a scientific viewpoint.

- **Degree to which the impact may cause irreplaceable loss of resources**

Irreplaceable loss of fossil heritage resources is not anticipated here.

- **Degree to which the impact can be mitigated**

Given the lack of evidence for vulnerable fossils on site, there are no recommendations for specialist monitoring or mitigation for the Sonbesie Solar Power Plant project on Farm Retreat 671.

Should significant fossil remains - such as well-preserved stromatolites - be exposed during construction, the responsible Environmental Control Officer should safeguard these, preferably *in situ*. The South African Heritage Resources Authority (SAHRA) should be alerted as soon as possible (Contact details: Mrs Colette Scheermeyer, P.O. Box 4637, Cape Town 8000, Tel: 021 462 4502, Email: cscheermeyer@sahra.org.za), so that appropriate action can be taken by a professional palaeontologist, at the developer's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (*e.g.* stratigraphy, sedimentology, taphonomy) by a professional palaeontologist. The palaeontologist concerned with mitigation work will need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (*e.g.* museum or university collection). These recommendations should be included within the EMPr for the proposed solar power plant development.

- **Cumulative impacts**

  Cumulative impacts could arise as other similar projects are constructed in the area. According to the Energy Blog's database only one other solar PV plant has been granted preferred bidders status within close proximity to the proposed Sonbesie PV plant:

  Waterloo Solar Park with a capacity of 75MW near Vryburg, North West Province (Approvals, planning and financing phase).

  According to the Department's database numerous other solar plants have been proposed in relative close proximity to the proposed activity, namely:

  The proposed Carocraft Solar Park near Vryburg, North West Province (14/12/16/3/3/2/374);
  - Construction of the 75MW Photovoltaic facility and associated infrastructure in Naledi (14/12/16/3/3/2/390).
  - The proposed Tiger Kloof Solar Photovoltaic energy facility near Vryburg, North West Province (14/12/16/3/3/2/535).
  - The proposed Keren Energy Bosh Pan Solar Plant, Northern Cape Province (14/12/16/3/3/1/563);
  - The proposed renewable energy generation project. Carocraft Solar Park in North West Province (14/12/16/3/3/2/699);
  - The proposed Renewable Energy Genertion Project rem farm Elda, North West (14/12/16/3/3/2/750);
  - The proposed Renewable Energy Project on Farm Doornbult 29 and Doornbult 33, North West (14/12/16/3/3/2/751);

  Environamics and other environmental consultants are also in the process of applying for Environmental Authorisation for other PV projects in the area, namely:

  - The proposed Protea Solar Power Plant near Vryburg, North West Province.
  - The proposed Gamma Solar Power Plant near Vryburg, North West Province.
  - The proposed Alpha Solar Power Plant near Vryburg, North West Province.
  - The proposed Meerkat Solar Power Plant near Vryburg, North West Province.
  - The proposed Sonbesie Solar Power Plant near Vryburg, North West Province.
  - Three PV Solar Energy facilities on the farm Klondike - AMDA Developments

  The potential for cumulative impacts may therefore exist. The Environmental Impact Assessment (EIA) Report will include a detailed assessment of the potential cumulative impacts associated with the proposed development.

6. CONCLUSIONS & RECOMMENDATIONS

The Sonbesie Solar Power Plant study area is underlain at depth by late Archaean (*c*. 2.6 billion year-old) sedimentary rocks of the Schmidtsdrif Subgroup (Ghaap Group, Transvaal Supergroup) and possibly also by Dwyka Group glacial rocks. These ancient bedrocks are entirely mantled by much younger, Late Caenozoic calcrete hardpans, sandy soils of possible aeolian origin and relict alluvial gravels related to the Dröe Harts River.

No fossil remains were recorded from the surface rocks during field assessment and it is inferred that they are of low palaeontological sensitivity. It is concluded that, with or without mitigation, the overall impact of the proposed Sonbesie Solar Power Plant on Farm Retreat 671 is of **NEGATIVE LOW SIGNIFICANCE** in palaeontological heritage terms.

7. ACKNOWLEDGEMENTS

Mr Dick Berlijn of Sonbesie Solar Power Plant (RF) (Pty) Ltd is thanked for commissioning this study. I am grateful to his colleague Ms Claire Phutieagae for kindly providing all the necessary background information, for facilitating our field visit, as well as for introducing us to the study area. Field assistance, logistical backup and companionship from Ms Madelon Tusenius is, as always, much appreciated.

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9. QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape, Limpopo, Northwest and the Free State under the aegis of his Cape Town-based company *Natura Viva* cc. He has served as a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and APHP (Association of Professional Heritage Practitioners – Western Cape).

Declaration of Independence

I, John E. Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

Dr John E. Almond
Palaeontologist
***Natura Viva* cc**

APPENDIX: GPS LOCALITY DATA FOR NUMBERED SITES LISTED IN TEXT

All GPS readings were taken in the field using a hand-held Garmin GPSmap 60CSx instrument. The datum used is WGS 84.

Loc number	GPS data	Comments
214	S27° 00' 31.2" E24° 41' 01.4"	Calcrete hardpan with sparse enclosed gravels derived from the Boomplaas and Vryburg Formation, north of farmstead.
215	S26° 59' 38.5" E24° 41' 38.5"	Coarse alluvial gravels of brown-weathering quartzite in NE corner of study area
216	S26° 59' 51.7" E24° 41' 14.2"	Downwasted and alluvial gravels of quartzite (some crudely flaked), calcrete, Ventersdorp lava on periphery of small pan.
217	S27° 00' 40.6" E24° 40' 58.1"	Low exposures of dense blue-grey, veined calcrete hardpan just south of homestead.