



**DESKTOP PALAEOONTOLOGICAL  
HERITAGE IMPACT ASSESSEMENT  
REPORT ON THE SITE OF A  
PROPOSED SOLAR POWER  
PRODUCTION FACILITY KNOWN  
AS THE SENEKAL 2 SOLAR ENERGY  
FACILITY ON THE FARM  
HARLINGEN 13433, KWA-ZULA  
NATAL PROVINCE**

13 July 2014

Prepared for:  
Heritage Contracts and Archaeological  
Consulting CC

On behalf of:  
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**DESKTOP PALAEOLOGICAL HERITAGE IMPACT ASSESSEMENT REPORT ON  
THE SITE OF A PROPOSED SOLAR POWER PRODUCTION FACILITY KNOWN AS  
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Prepared for:

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On Behalf of:

Building Energy SPA

Prepared By:

Prof B.D. Millstead

Palaeontological Impact Assessment Report –On the site of a proposed solar power production facility known as Senekal s Solar Energy Facility, on the farm Harlingen 13433, Kwa-Zulu Natal Province.

## **EXECUTIVE SUMMARY**

Building Energy SPA, an Independent Power Producer (IPP), is proposing the establishment of a small-scale commercial solar energy facility (using photovoltaic technology) of approximately 5 MW in capacity. The site is located approx. 2 km west of Mkuze, parallel to the N2 on the Remainder of the farm Harlingen 13433, in Kwa-Zulu Natal; the facility development footprint will be less than 10 ha. The proposed project will be referred to as the Senekal 2 Solar Energy Facility.

Building Energy SPA has appointed Savannah Environmental (Pty) Ltd to undertake a Basic Environmental Impact Assessment of the project. Savannah Environmental (Pty) Ltd has appointed Heritage Contract and Archaeological Consulting CC, as independent consultants, to undertake a desktop Heritage Impact Assessment of the project area. Heritage Contract and Archaeological Consulting CC has contracted BM Geological Services to provide a desktop Palaeontological Heritage Impact Assessment Report in respect of the proposed project that will form part of the final Heritage Impact Assessment Report.

The entire project area is underlain by unfossiliferous picritic lavas of the Jurassic Letaba Formation. Due to the unfossiliferous nature of this geological unit, the potential for a negative impact on the fossil heritage of the area the probability and significance of a negative impact on the palaeontological heritage of the Letaba Formation in the project area is nil.

The project has been assessed as being socially beneficial, herein, as it would provide electricity to an increasingly stressed national power grid. This positive assessment does not need to be balanced against any potential negative impact on the palaeontological heritage of either project area as no fossil materials are expected to be negatively impacted. As no fossil materials are expected to be negatively impacted by either project no damage mitigation procedures are outlined herein.

**In summary, this desktop study has not identified any palaeontological reason to prejudice the progression of the Senekal 2 Solar Energy Facility.**

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## **1 INTRODUCTION**

Building Energy SPA, an Independent Power Producer (IPP), is proposing the establishment of a small-scale commercial solar energy facility (using photovoltaic technology) of approximately 5 MW in capacity. The site is located approx. 2 km west of Mkuze, parallel to the N2 on the Remainder of the farm Harlingen 13433, in Kwa-Zulu Natal. The proposed project will be referred to as the Senekal 2 Solar Energy Facility. The facility development footprint will be less than 10 ha.

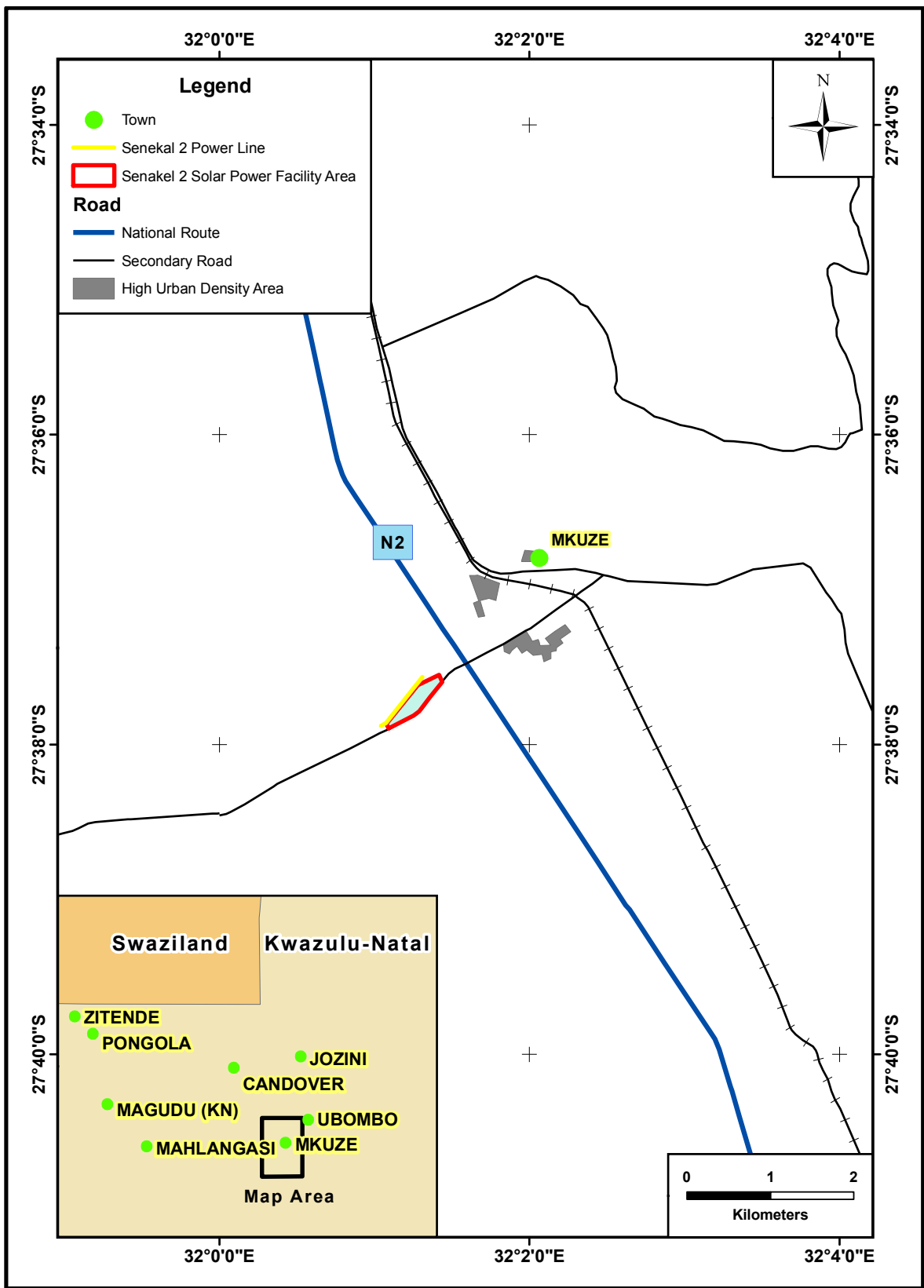
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## **2 TERMS OF REFERENCE AND SCOPE OF THE STUDY**

The terms of reference for this study were as follows:-

- Conduct a desktop assessment of the potential impact of the proposed project on the palaeontological heritage of the project area.
- Describe the possible impact of the proposed development on the palaeontological heritage of the site, according to a standard set of conventions.
- Quantify the possible impact of the proposed development on the palaeontological heritage of the site, according to a standard set of conventions.
- Provide an overview of the applicable legislative framework.
- Make recommendations concerning future work programs as, and if, necessary.

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**Figure 1:** Location map showing the position of the Senekal 2 Solar Energy Facility and its associated proposed power line.

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### **3 LEGISLATIVE REQUIREMENTS**

South Africa's cultural resources are primarily dealt with in two Acts. These are the National Heritage Resources Act (Act 25 of 1999) and the National Environmental Management Act (Act 107 of 1998).

#### **3.1 The National Heritage Resources Act**

The following are protected as cultural heritage resources by the National Heritage Resources Act:

- Archaeological artefacts, structures and sites older than 100 years,
- Ethnographic art objects (e.g. prehistoric rock art) and ethnography,
- Objects of decorative and visual arts,
- Military objects, structures and sites older than 75 years,
- Historical objects, structures and sites older than 60 years,
- Proclaimed heritage sites,
- Grave yards and graves older than 60 years,
- Meteorites and fossils,
- Objects, structures and sites of scientific or technological value.

The Act also states that those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities. The national estate includes the following:

- Places, buildings, structures and equipment of cultural significance,
- Places to which oral traditions are attached or which are associated with living heritage,
- Historical settlements and townscapes,
- Landscapes and features of cultural significance,
- Geological sites of scientific or cultural importance,
- Sites of Archaeological and palaeontological importance,
- Graves and burial grounds,
- Sites of significance relating to the history of slavery,
- Movable objects (e.g. archaeological, palaeontological, meteorites, geological specimens, military, ethnographic, books etc.).

#### **3.2 Need for Impact Assessment Reports**

Section 38 of the Act stipulates that any person who intends to undertake an activity that falls within the following:

- The construction of a linear development (road, wall, power line, canal etc.) exceeding 300 m in length,
- The construction of a bridge or similar structure exceeding 50 m in length,



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- Any development or other activity that will change the character of a site and exceed 5 000 m<sup>2</sup> or involve three or more existing erven or subdivisions thereof,
- Re-zoning of a site exceeding 10 000 m<sup>2</sup>,
- Any other category provided for in the regulations of SAHRA or a provincial heritage authority.

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development. If there is reason to believe that heritage resources will be affected by such development, the developer may be notified to submit an impact assessment report. A Palaeontological Impact Assessment (PIA) only looks at the potential impact of the development palaeontological resources of the proposed area to be affected.

### **3.3 Legislation Specifically Pertinent to Palaeontology\***

\*Note: Section 2 of the Act defines “palaeontological” material as “any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains”.

Section 35(4) of this Act specifically deals with archaeology, palaeontology and meteorites. The Act states that no person may, without a permit issued by the responsible heritage resources authority (national or provincial):

- Destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite,
- Destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite,
- 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
- Bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment that assists in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites,
- Alter or demolish any structure or part of a structure which is older than 60 years as protected.

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The above mentioned palaeontological objects may only be disturbed or moved by a palaeontologist, after receiving a permit from the South African Heritage Resources Agency (SAHRA). In order to demolish such a site or structure, a destruction permit from SAHRA will also be needed.

Further to the above point, Section 35(3) of this Act indicates that “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”. Thus, regardless of the granting of any official clearance to proceed with any development based on an earlier assessment of its impact on the Palaeontological Heritage of an area, the development should be halted and the relevant authorities informed should fossil objects be uncovered during the progress of the development.

### **3.4 The National Environmental Management Act [as amended]**

This Act does not provide the detailed protections and administrative procedures for the protection and management of the nation’s Palaeontological Heritage as are detailed in the National Heritage Resources Act, but is more general in its application. In particular Section 2(2) of the Act states that environmental management must place people and their needs at the forefront of its concerns and, amongst other issues, serve their cultural interests equitably. Further to this point section 2(4)(a)(iii) states that disturbances of sites that constitute the nation’s cultural heritage should be avoided, and where it cannot be avoided should be minimised and remedied.

Section 23(1) indicates that a general objective of integrated environmental management is to identify, predict and evaluate the actual and potential impact of activities upon the cultural heritage. This section also highlights the need to identify options for mitigating of negative effects of activities with a view to minimising negative impacts.

In order to give effect to the general objectives of integrated environmental management outlined in the Act the potential impact on cultural heritage of activities that require authorisation or permission by law must be investigated and assessed prior to their implementation and reported to the relevant organ of state. Thus, a survey and evaluation of cultural resources must be done in areas where development projects that will potentially negatively affect the cultural heritage will be performed. During this process the impact on the cultural heritage will be determined and proposals for the mitigation of the negative effects made.

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#### **4 RELEVANT EXPERIENCE**

Prof Millsted holds a PhD in palaeontology and has previously been employed as a professional palaeontologist with the Council for Geoscience in South Africa. He is currently the principle of BM Geological Services and has sufficient knowledge of palaeontology and the relevant legislation required to produce this Palaeontological Impact Assessment Report. Dr Millsted is registered with the South African Council for Natural Scientific Professions (SACNASP), and is a member of the Palaeontological Society of South African and the Geological Society of South Africa.

#### **5 INDEPENDENCE**

Prof Millsted was contracted as an independent consultant to conduct this Palaeontological Heritage Impact Assessment study and shall receive fair remuneration for these professional services. Neither Prof Millsted nor BM Geological Services has any financial interest in Building Energy SPA or the proposed Senekal 2 Solar Energy Facility.

#### **6 GEOLOGY AND FOSSIL POTENTIAL**

Figure 2 shows that the project area is completely underlain by rocks of the Jurassic Letaba Formation. A summary of the characteristics of the Letaba Formation and its fossiliferous potential follows.

##### **6.1 Letaba Formation**

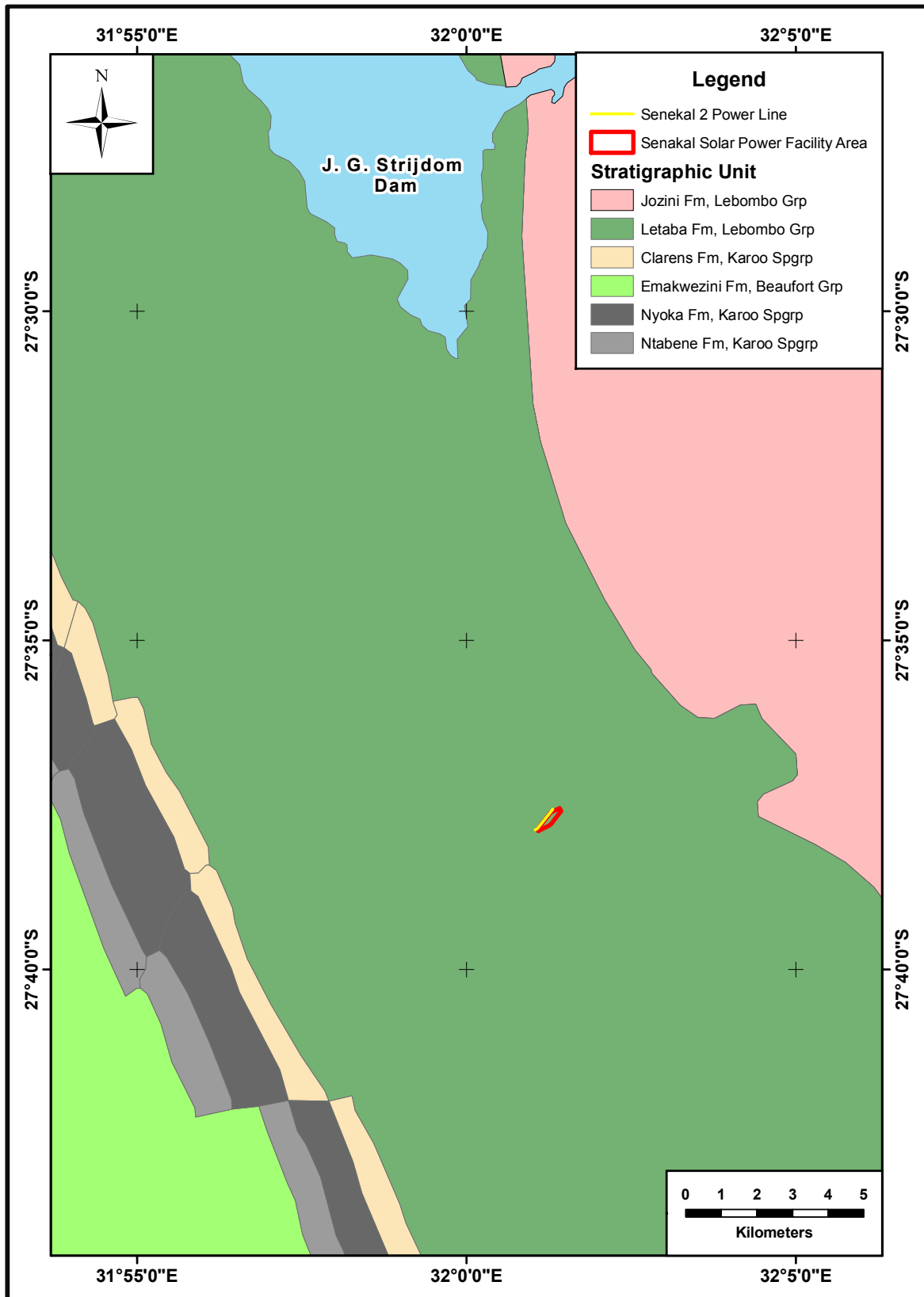
###### **6.1.1 Geology**

The Letaba Formation (Lebombo Group) comprises a sequence of picritic (olivine-rich) lavas which form part of the Jurassic Karoo Igneous Province (Duncan and Marsh, 2006). The unit accordingly correlates with part of the Drakensberg Group lavas that terminate the Karoo sedimentation in the Main Karoo Basin.

###### **6.1.2 Palaeontological potential**

The extrusive magmatic origins of the rocks that comprise the Letaba Formation preclude the possibility of any fossil materials being present within the unit. Thus, the palaeontological potential of the Letaba Formation is assessed as being **nil**.

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**Figure 2:** Generalised geological map of the areas underlying the Senekal 2 Solar Energy Facility as well as its associated proposed power line and their immediate environs.

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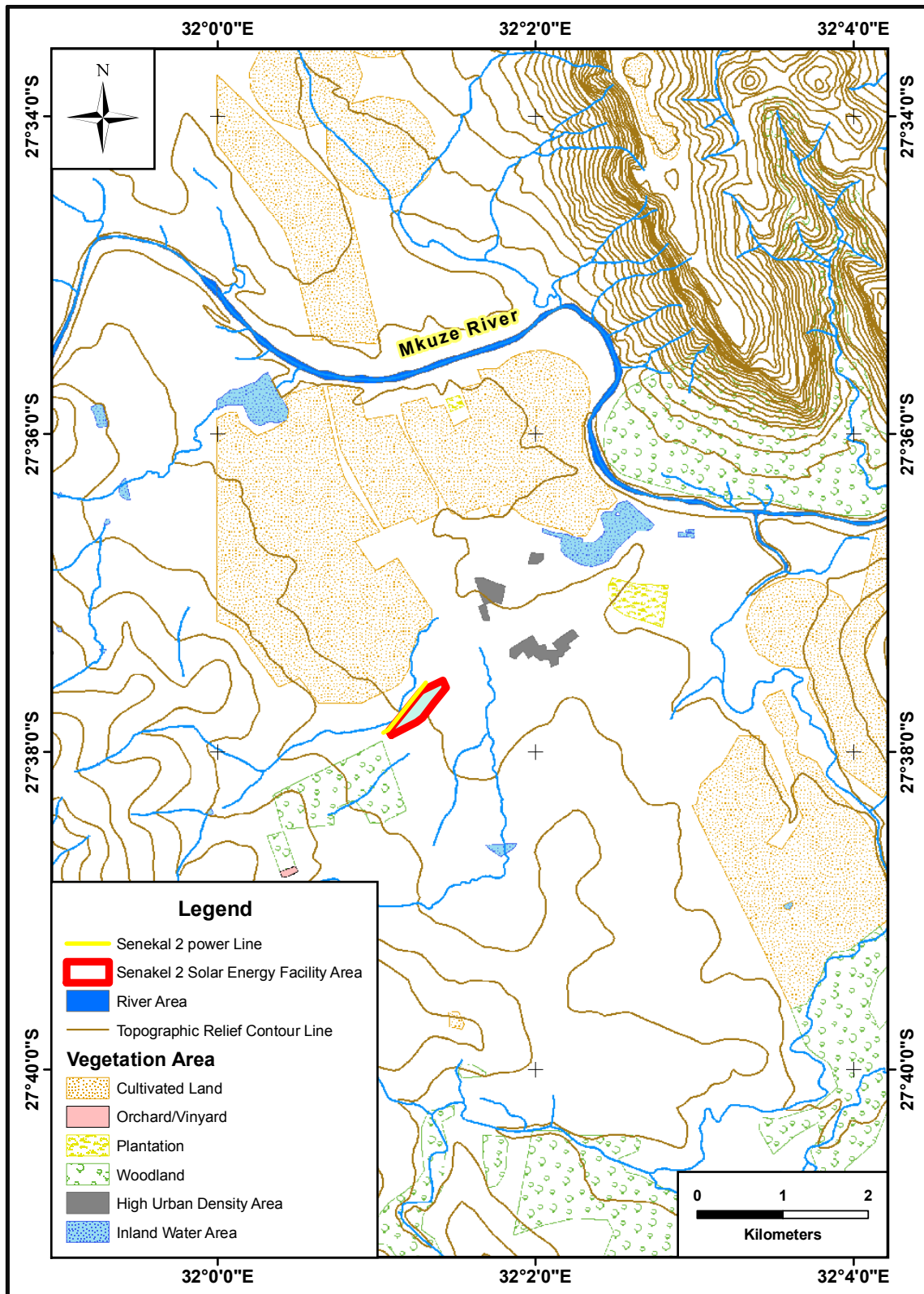
## 7 ENVIRONMENT OF THE PROPOSED PROJECT SITE

The area underlain by the project areas is approximately 12 ha, but the final footprint of the project will be < 10 ha. Examination of Google earth imagery (Figure 3) indicates that the proposed location of the photovoltaic generation facility and the associated proposed power line are located upon seemingly undeveloped land. The associated proposed power transmission line will be located parallel to, and immediately proximal to the north-western margin of the power generation facility on previously disturbed land. It will connect with the Mkuze Substation near the south-western corner of the Senekal 2 Solar Power Facility. Mucina and Rutherford (2006) indicate that the vegetation cover of the project area (including the power line) consists of the Zululand Lowveld veld type (Figure 4). The conservation status of the Zululand Lowveld veld type is described by Mucina and Rutherford as vulnerable. The project area lies approximately 3.5 km south of the Mkuze River (Figure 5). Topographically the land surface underlying the project area is relatively flat, and featureless. No significant fluvial drainage lines traverse the project area, although a drainage line located immediately to the north drains to the southwest and eventually unites with the Mkuze River.



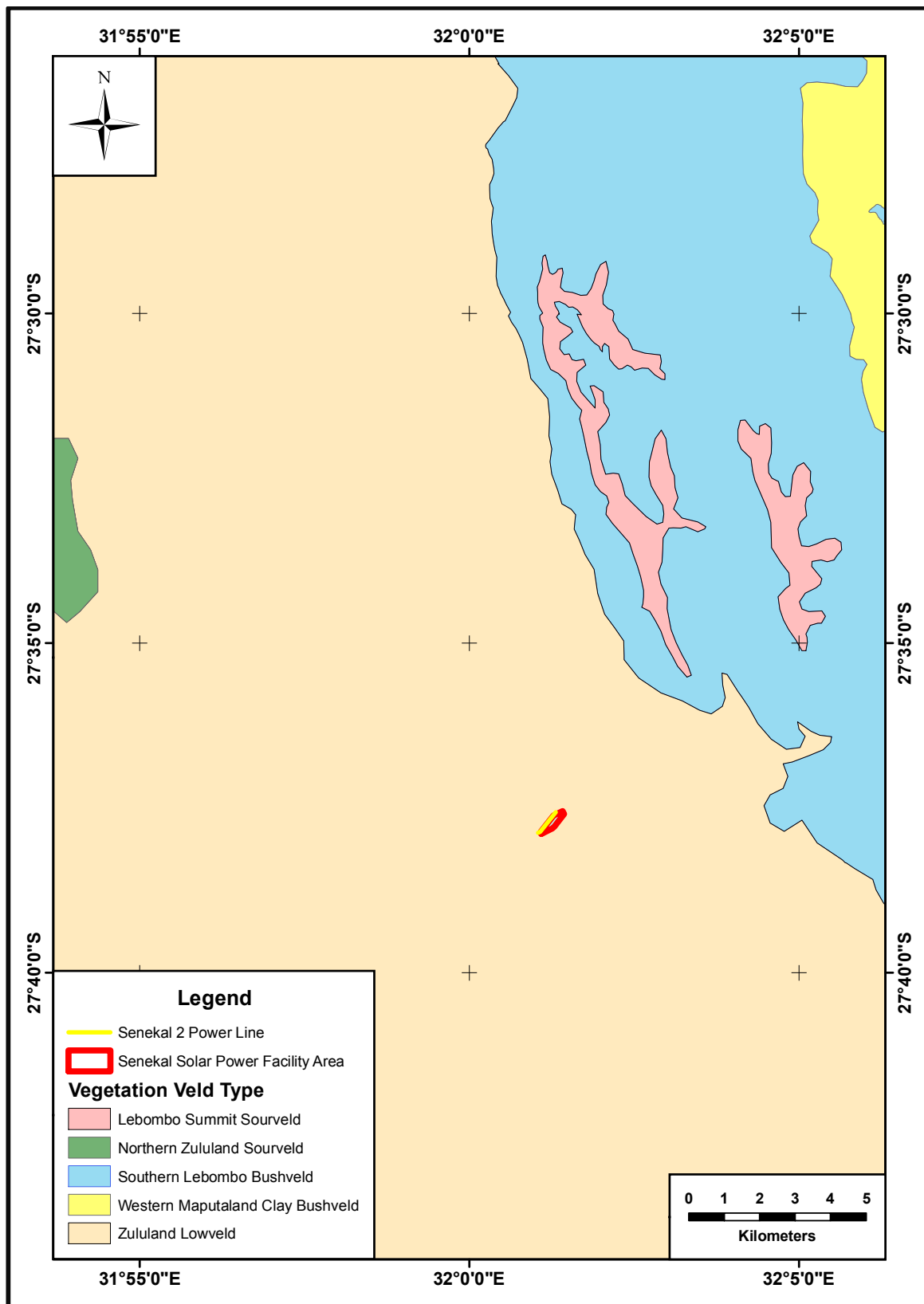
**Figure 3:** Google earth image of the site of the proposed Senekal 2 Solar Energy Facility (red polygon) and its associated power line (yellow line).

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**Figure 4:** Map of the two project area and its immediate environs. The project area lies on a relatively flat, featureless land surface between two areas of elevated land. No significant fluvial systems traverse the proposed infrastructure. The topographic contour interval is 20 m.

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**Figure 5:** Map of the distribution of the vegetation veld types located beneath the project area and within its immediate environs (after Mucina and Rutherford, 2006).

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## **8 OVERVIEW OF SCOPE OF THE PROJECT**

The facility development footprint of the proposed Senekal 2 Solar Energy Facility will be less than 10 ha in extent within which the following infrastructure will be established:

- Arrays of photovoltaic (PV) panels with a capacity of up to 5 MW.
- Mounting structures to support the PV panels.
- Cabling between the project components, to be lain underground.
- Inverters/transformer enclosures.
- An on-site switching station.
- An overhead power line of approx. 500 m to connect Mkuze Substation.
- Internal access roads.
- Fencing and workshop area for maintenance, storage and an on-site office.

### **8.1 Effect of project on the geology**

It may be interpreted from Section 9 above that the development anticipated within the project area could be expected to be restricted to the upper 1-2 m of the land surface, with the deepest anticipated impacts upon the underlying geology resulting from the excavations required to lay the underground cables, and for the foundations required for the various buildings and photovoltaic panels.

## **9 IMPACT ASSESSMENT**

The potential impact of the proposed mining area is categorised below according to the following criteria:-

### **9.1 Nature of Impact**

The potential negative impacts of the proposed project on the palaeontological heritage of the area are:

- Damage or destruction of fossil materials during the construction of project infrastructural elements to a maximum depth of those excavations. Many fossil taxa (particularly vertebrate taxa) are known from only a single fossil and, thus, any fossil material is potentially highly significant. Accordingly, the loss or damage to any single fossil can be potentially significant to the understanding of the fossil heritage of South Africa and to the understanding of the evolution of life on Earth in general. Where fossil material is present and will be directly affected by the building or construction of the projects infrastructural elements the result will potentially be the irreversible damage or destruction of the fossil(s).



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- Movement of fossil materials during the construction phase, such that they are no longer *in situ* when discovered. The fact that the fossils are not *in situ* would either significantly reduce or completely destroy their scientific significance.
- The loss of access for scientific study to any fossil materials present beneath infrastructural elements for the life span of the existence of those constructions and facilities.

## 9.2 Extent of impact

The possible extent of the permanent impact of the proposed project on the palaeontological heritage of South Africa is restricted to the damage, destruction or accidental relocation of fossil material caused by the excavations and construction of the necessary infrastructure elements forming part of the project. The possible source of a less permanent negative impact on the palaeontological heritage is the loss of access for scientific research to any fossil materials that become covered by the various infrastructural elements that comprise the project. The **extent of the area of potential impact is, accordingly, categorised as local** (i.e., restricted to the project site).

## 9.3 Duration of impact

The anticipated duration of the identified potential impact is assessed as potentially **permanent to long term**. This assessment is based on the fact that, in the absence of mitigation procedures (should fossil material be present within the area to be affected) the damage or destruction of any palaeontological materials will be permanent. Similarly, any fossil materials that exist below the structures and infrastructural elements that will constitute the two industrial parks will be unavailable for scientific study for the life of the existence of those features.

## 9.4 Probability of impact

The Letaba Formation completely underlies both the proposed Senekal 2 Solar Energy Facility and its associated proposed new power transmission line. The geological unit is composed entirely of extrusive igneous rocks (lavas) of picritic composition which are unfossiliferous. The probability either project resulting in a negative impact upon the palaeontological heritage of the formation is assessed as being **nil**.

## 9.5 Significance of the impact

The rocks of the Letaba Formation are unfossiliferous, thus, the significance of any affect of the mining operations on the palaeontological heritage of this unit is **nil**.

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## 9.6 Severity / Benefit scale

The proposed project is categorised, herein, as being potentially **beneficial**. This classification is based on the intention that the project will provide renewable energy to an increasingly strained national power grid.

The probability of a negative impact on the palaeontological heritage of the project areas has been categorised as **nil**. As such there are no negative effects on the palaeontological heritage of either project area that must be weighed against the potential benefits of either project.

## 9.7 Status

Given the combination of factors discussed above, it is anticipated that the construction phase of the project will result in no negative effect on the palaeontological heritage of the area. As the proposed project would provide electricity to the national power grid which is currently regularly failing to meet the demands placed upon it. The project is determined as having a **positive status** herein.

## 10 DAMAGE MITIGATION, REVERSAL AND POTENTIAL IRREVERSABLE LOSS

The degree to which the possible negative effects of the proposed project can be mitigated, reversed or will result in irreversible loss of the palaeontological heritage can be determined as discussed below.

### 10.1 Mitigation

Due to the unfossiliferous nature of the rocks underlying the Senekal 2 Solar Energy Facility it is not anticipated that any fossil materials will be negatively impacted upon. Accordingly, no damage mitigation procedures are required to be outlined for the project.

### 10.2 Reversal of damage

Any damage to, or the destruction of, palaeontological materials or reduction of scientific value due to a loss of the original location is **irreversible**.

### 10.3 Degree of irreversible loss

Once a fossil is damaged, destroyed or moved from its original position without its geographical position and stratigraphic location being recorded the **damage is irreversible**.

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Fossils are usually scarce and sporadic in their occurrence and the chances of negatively impacting on a fossil in any particular area are low. However, any fossil material that may be contained within the strata geological strata are potentially of the greatest scientific and cultural importance. Thus, the potential always exists during construction and excavation within potentially fossiliferous rocks for the permanent and irreversible loss of extremely significant or irreplaceable fossil material. This said, many fossils are incomplete in their state of preservation or are examples of relatively common taxa. As such, just because a fossil is present it is not necessarily of great scientific value. Accordingly, not all fossils are necessary significant culturally or scientifically significant and the potential degree of irreversible loss will vary from case to case. The judgement on the significance of the fossil must be made by an experienced palaeontologist.

## **11 ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE**

The information provided within this report was derived from a desktop study of available maps and scientific literature; no direct observation was made of the area as result of a site visit.

## **12 ENVIRONMENTAL IMPACT STATEMENT**

A desktop study has been conducted on the sites of the proposed Senekal 2 Solar Energy Facility. The area identified herein as the Senekal 2 Solar Energy Facility is moderately large (approximately 12 ha although the eventual project footprint is expected to be < 10 ha). However, any negative impacts to the palaeontological heritage of the region will be limited to the footprint area of either development area. The extent of any impacts is accordingly characterised as local.

In terms of the effects of the required construction operations disruption to geological strata will be restricted to the picritic lavas of the Jurassic Letaba Formation; this geological unit is unfossiliferous. Accordingly, no negative effect upon the palaeontological heritage of the underlying the project is anticipated.

The social benefits of the project have been classified as beneficial, herein, as the project aims to provide electricity to the increasingly stressed national power grid. This positive assessment does not need to be balanced against any possible negative impacts upon the palaeontological heritage of either project area. As such **this desktop study has not identified any palaeontological reason to prejudice the progression of the Senekal 2 Solar Energy Facility.**

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13<sup>th</sup> July 2014