

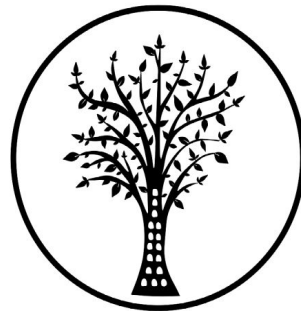
# DESKTOP PALAEOONTOLOGICAL SPECIALIST STUDY

In terms of Section 38(8) of the NHRA

## PROPOSED DEVELOPMENT OF NYALA SOLAR PV STEP-UP FACILITIES, POWER LINE AND SUBSTATION, NEAR WELKOM, FREE STATE PROVINCE

**Prepared by**

**Jenna Lavin and Prof. M. Bamford**



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In Association with

**Savannah Environmental Services**

February 2020



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## THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I, Jenna Lavin, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favorable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

Signed:

**Name: Jenna Lavin**

**Date: 04 February 2020**



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## EXECUTIVE SUMMARY

Nyala Photovoltaic (Pty) Ltd proposed the development of a 44kV power line, substation and two step-up facilities to connect the authorised Nyala PV Solar Facility to the national grid. The proposed infrastructure will be assessed within a larger corridor. The infrastructure is proposed to be developed on the Remaining Extent of the Farm Rietpan 17 and Farm Mijannie 162 located ~7km north-west of Welkom within the Matjhabeng Local Municipality and the Lejweleputswa District Municipality.

The Nyala PV Solar Facility (Case 7956) was subject to a NEMA process in 2015. As part of this process, Prof. M. Bamford completed a Desktop Palaeontological Impact Assessment for this proposed PV Facility. SAHRA approved the Desktop Assessments completed by Prof. Bamford in a letter dated 7 July 2015. Prof. Bamford's report is used as the primary source of data for this desktop assessment, along with other PIA's and relevant reports from this area.

The poor quality coal deposits of the Volksrust Formation are the most palaeontological sensitive sediments within close proximity to the proposed development area. These sediments are located well below the surface, and are overlaid with aeolian Quaternary sand sediments. The proposed infrastructure consists of a 44kV single -circuit power line, substation and two step-up facilities to connect the authorised Nyala PV Solar Facility to the Eskom grid. This infrastructure will have foundations of a few meters depth only, and as per the recommendations included in Bamford (2015), it is very unlikely that the project will impact on any significant palaeontological material.

Based on the information available in Bamford (2015) as well as the information included in this report, it is very unlikely that the proposed 44kV power line, substation and step-up facilities will impact on any significant palaeontological material. However, as per SAHRA's responses in 2015, it is recommended that:

- Should any palaeontological remains be found during construction activities, work must immediately stop in that area and the ECO must be informed. The attached Chance Finds Procedure must be implemented.
- The ECO must inform the South African Heritage Resource Agency (SAHRA) and contact a palaeontologist, to assess the importance of these finds and rescue them if necessary (with the relevant SAHRA permit). No work may be resumed in this area without the permission from the ECO and SAHRA.



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1. Chance Fossil Finds Procedure



## 1. INTRODUCTION

### 1.1 Background Information on Project

Nyala Photovoltaic (Pty) Ltd proposes the development of a 44kV power line, substation and two step-up facilities to connect the authorised Nyala PV Solar facility to the national grid. The proposed infrastructure will be assessed within a larger corridor. The infrastructure is proposed to be developed on the Remaining Extent of the Farm Rietpan 17 and Farm Mijannie 162 located ~7km north-west of Welkom within the Matjhabeng Local Municipality and the Lejweleputswa District Municipality.

The Nyala PV Solar facility (Case 7956) was subject to a NEMA process in 2015. As part of this process, Prof. M. Bamford completed a Desktop Palaeontological Impact Assessment for this proposed PV Facility (NID 310004 in Figure 7). SAHRA approved the Desktop Assessments completed by Prof. Bamford in a letter dated 7 July 2015. Prof. Bamford's report is used as the primary source of data for this desktop assessment, along with other PIA's and relevant reports from this area.

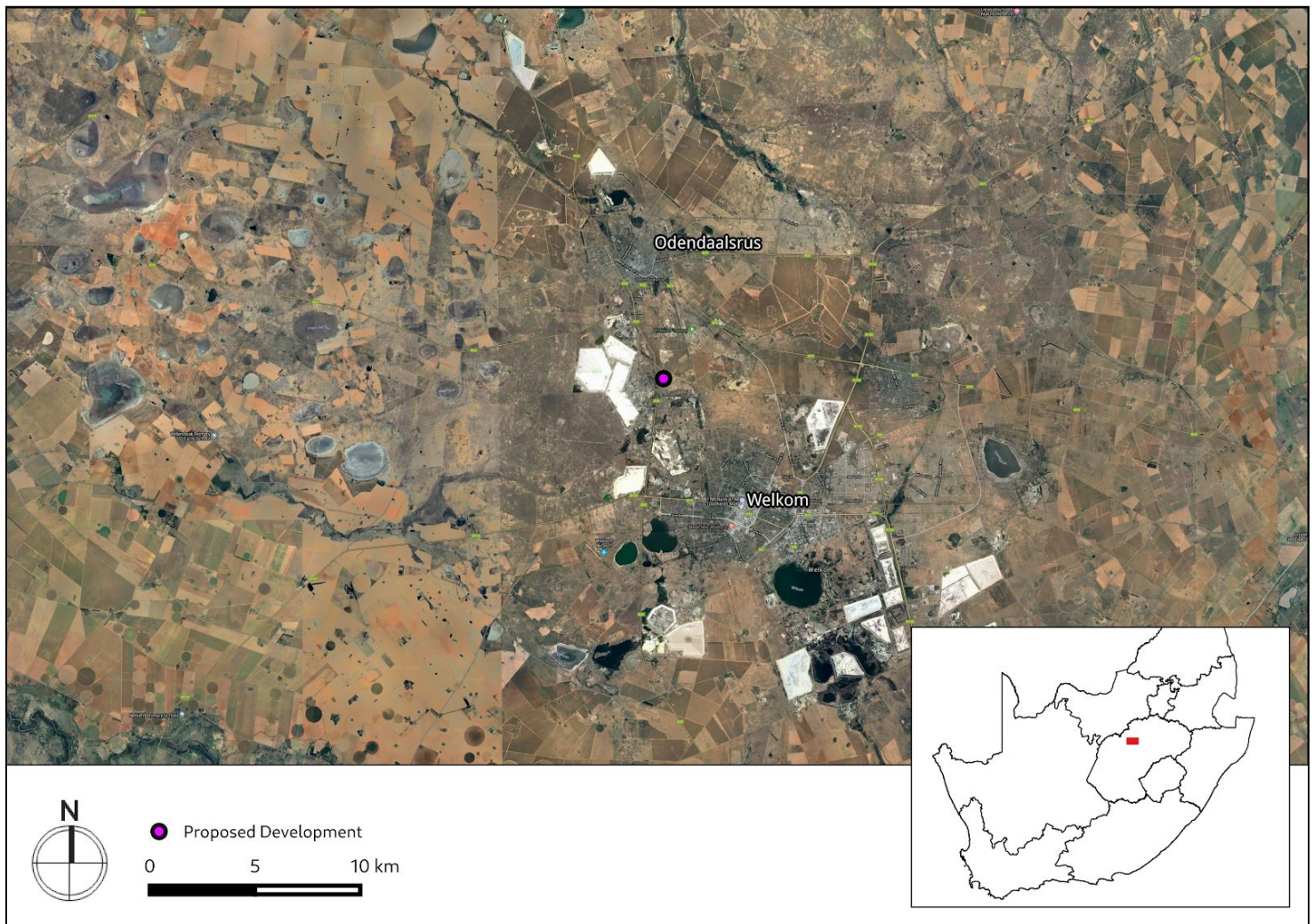
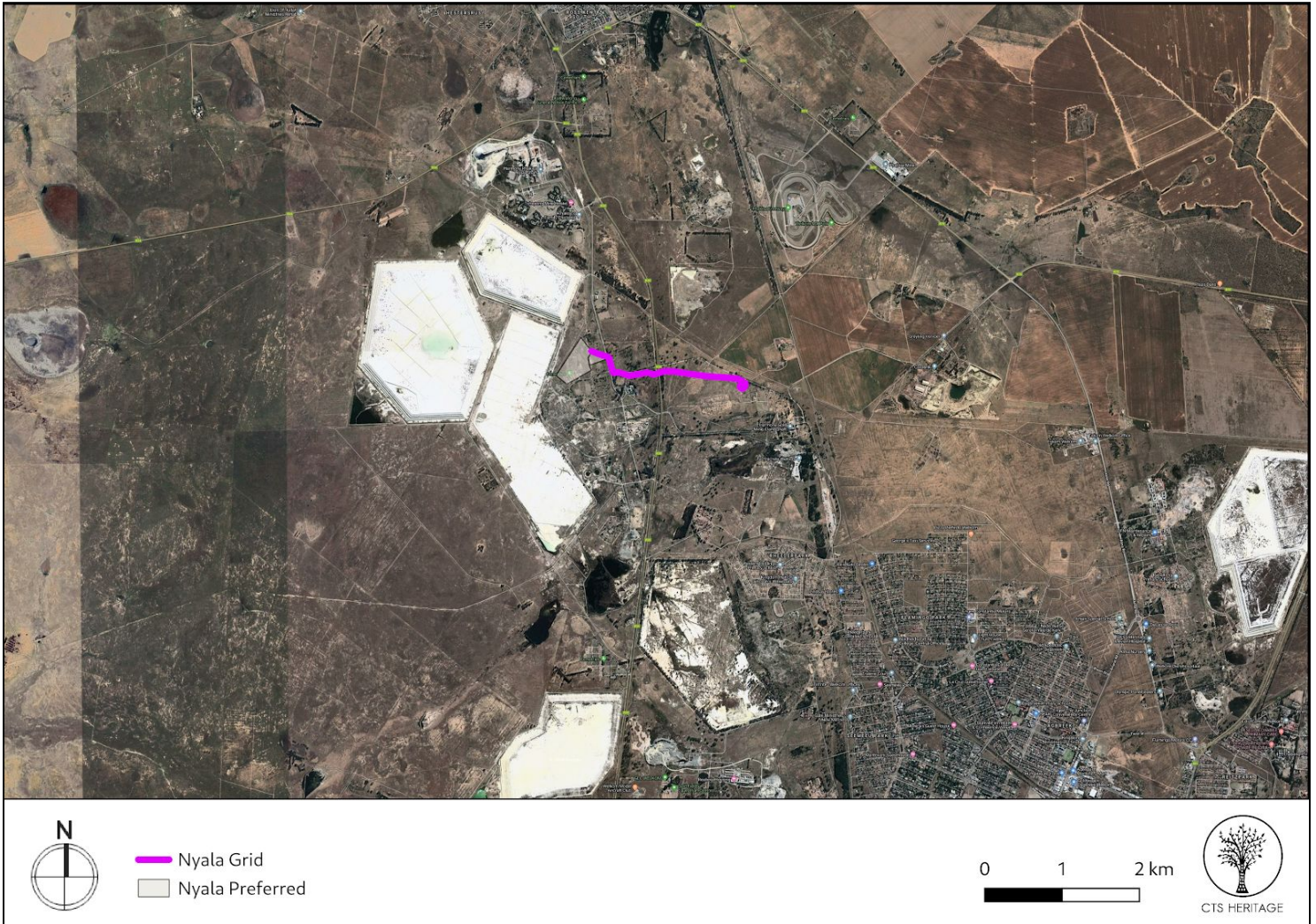


Figure 1: Google Earth© satellite image of the proposed development area



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**Figure 2: Google Earth© satellite image of the proposed grid connection infrastructure**

## **2. METHODOLOGY**

### **2.1 Purpose of Palaeontological Study**

According to the SAHRA Palaeosensitivity map, the area is underlain by formations of moderate and high palaeontological sensitivity. The proposed grid connection infrastructure is located within sediments of moderate palaeontological sensitivity (Figure 4). Due to the high palaeontological sensitivity of some of the sediments located within close proximity to the proposed development area, a Desktop Palaeontological Assessment has been completed. This Desktop Assessment will provide background information on the palaeontological sensitivity of the areas proposed for development, as well as an indication of the likelihood of significant fossil material being impacted by the proposed development. Furthermore, this report will propose mitigation measures to limit the negative potential impact on palaeontological heritage resources.



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Figure 3: Google Earth© satellite image of the proposed grid connection infrastructure

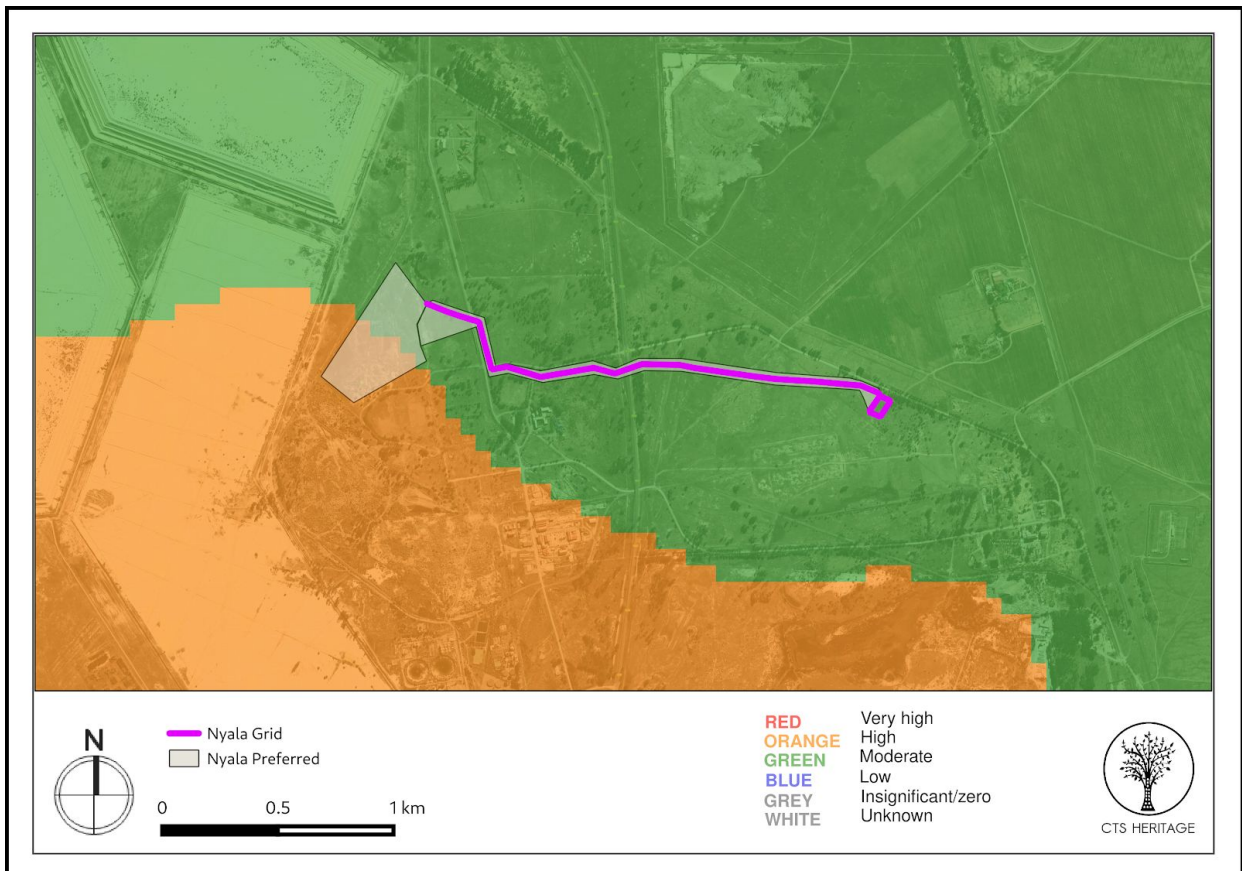


Figure 4: Palaeosensitivity Map. Indicating Moderate to High fossil sensitivity underlying the study area.



## 2.2 Study approach

This Desktop PIA report provides a record of the observed or inferred palaeontological heritage resources within the broader project study area. The identified resources have been assessed to evaluate their heritage significance in terms of the grading system outlined in Section 3 of the NHRA (Act 25 of 1999). Recommendations for specialist palaeontological mitigation are made where this is considered necessary. The report is based on a review of the relevant scientific literature, including previous palaeontological impact assessments in the broader study region published geological maps, project data, Google Earth satellite imagery and accompanying sheet explanations.

The base data used for this assessment relies on the geology maps provided by the Council of GeoScience as well as various academic papers - please see the reference list in section 7. As this report deals with palaeontological heritage, this baseline geological data is considered up to date.

## 2.3 Assumptions and Limitations

No fieldwork was conducted for this assessment. Fossils are often located below ground level and as such, would have been impossible to identify in a field assessment. Assumptions regarding palaeontological heritage and significance have therefore been made based on the desktop information presently available for this area. All possible measures have been taken to assess the likelihood of impact to significant palaeontological heritage.

## 3. GEOLOGICAL CONTEXT OF THE STUDY AREA

According to the geological map (Figure 5), the proposed sites for the Nyala grid connection infrastructure falls within Quaternary Aeolian sands (Qs). The Quaternary Sands in the area are relatively recent deposits. These sediments have been reworked over the last 2 Ma. From a palaeontological standpoint these sediments are of low concern. However, according to the PalaeoBio Database, two fossil species have been identified from the St. Helena Gold Mine (Figure 6) which, according to the geological map is situated within Quaternary Sand sediments, located approximately 20km to the south west of the proposed development area. This is discussed further below in section 4.2.

In close proximity to the proposed infrastructure development are sediments of the Permian Volksrust Formation which could contain coal deposits. According to Bamford (2015)(NID 310004 in Figure 7), “more detailed information of the region in Snyman (1998) shows that Free State Coal Field, between the Vaal River in the north and Theunissen in the south contains a coal zone that is 25 to 50m thick. In the north the coal occurs 50-100m below the surface and in the south it occurs at 320-360m below the surface. At Odendaalsrus, therefore, the coal would be somewhere between 50 and 360m below the ground surface. The coals here are of poor quality and are no longer mined (Snyman, 1998).”

Bamford (2015) further goes on to explain that “coal is made of compressed and heat altered fossil plants and is of no palaeontological interest per se. However, good fossil plant material can occur in the shales and mudstones that occur within and between the coal seams (Cadle et al., 1993). There are no reports of fossils from this area in the published and unpublished (catalogues and field reports) of the Evolutionary Studies Institute, University of the Witwatersrand. Fossil vertebrates do not occur in association with coal deposits.”





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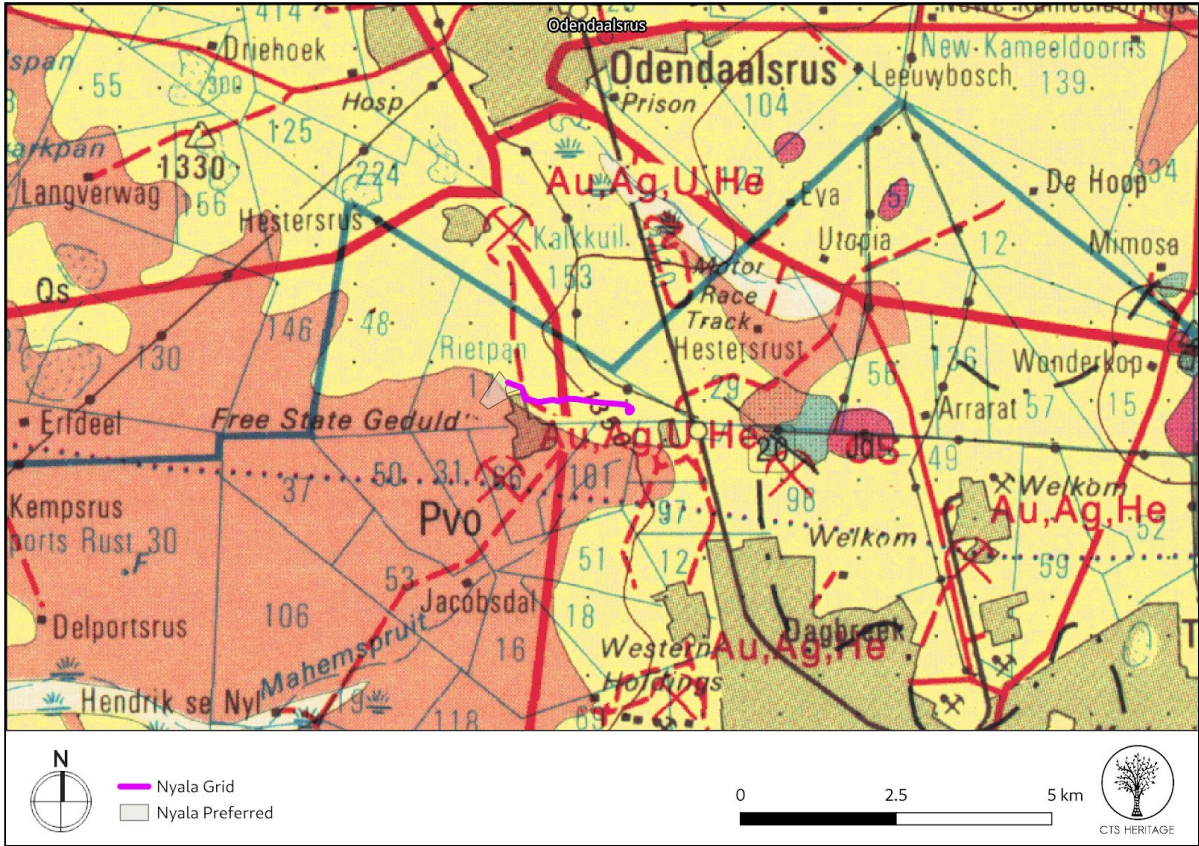


Figure 5: **Geology Map.** Indicating the underlying geology across the study area through overlaying the geology maps from the CGS series 2726 Kroonstad (Qs: Aeolian Quaternary Sands; Pvo: Volksrust Formation of the Ecca Group)

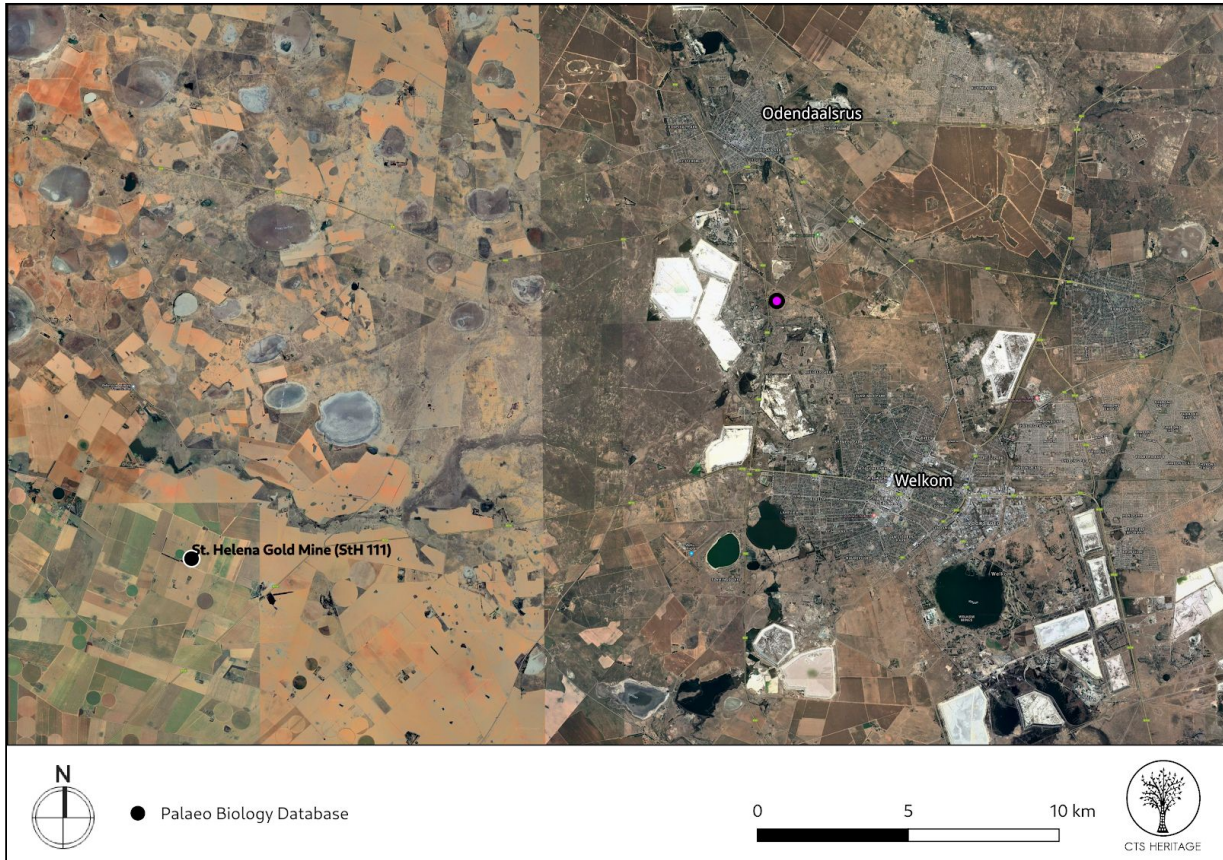


Figure 6: **Known Palaeontological Resources from the area from the PalaeoBio Database ([www.paleobiodb.org](http://www.paleobiodb.org))**



#### 4. PALAEOLOGICAL HERITAGE RESOURCES

##### 4.1. Review of regional palaeontology

**Table 1: Explanation of symbols in Figure 5 from Bamford (2015) as well as Groenewald (2014) and the SAHRIS Fossil Heritage Browser**

| Symbol | Group Formation                   | Lithology  | Approximate Age  | Palaeontology   |
|--------|-----------------------------------|--|--|---|
| Qs     | Quaternary Sands                  | Aeolian  | 2 Ma to today  | Very wide range of possible fossil remains, though these are often sparse, such as: mammalian bones and teeth, tortoise remains, ostrich eggshells, non-marine mollusc shells, ostracods, diatoms and other microfossil groups, trace fossils (e.g. calcretised termitaria, rhizoliths, burrows, vertebrate tracks), freshwater stromatolites, plant material such as peats, foliage, wood, pollens |
| Pvo    | Volksrust Formation, Eccca Group  | Mudstone, siltstone and shale                        | Middle Permian<br>290 – 266 Ma                         | Fossils include rare temnospondyl amphibian remains, invertebrates, minor coals with plant remains, petrified wood, and low-diversity marine to non-marine trace fossil assemblages   |
| Jd     | Jurassic Dolerite                 | Dolerite Dykes, intrusive                            | Jurassic, Approx.<br>180Ma                             | No fossils recorded   |
| Pv     | Vryheid Formation Eccca Group     | Sandstone, siltstone, shale                          | Middle Permian<br>290 – 266 Ma                         | Glossopteris Flora. Abundant, low diversity trace fossils, rare insects, possible conchostracans, non-marine bivalves and fish scales   |
| Pa     | Adelaide Subgroup, Beaufort Group | Sandstone, mudstone, siltstone                       | Mid Permian –<br>Earliest Triassic<br>c. 266 – 250 Ma  | Diverse terrestrial and freshwater tetrapods of <i>Pristerognathus</i> to <i>Dicynodon</i> Assemblage Zones (amphibians, true reptiles, synapsids – especially therapsids), palaeoniscoid fish, freshwater bivalves, trace fossils (including tetrapod trackways), sparse to rich assemblages of vascular plants ( <i>Glossopteris</i> Flora, including spectacular petrified logs), insects        |
| C-Pd   | Dwyka Group                       | Diamictite, conglomerate, sandstone, mudstone, shale | Late Carboniferous –<br>Early Permian<br>c. 320-290 Ma | Trace fossils, organic-walled microfossils, rare marine invertebrates (eg molluscs), fish, vascular plants  |
| Val    | Allanridge Subgroup               | Dolomite, chert                                      | Late Archaean<br>Randian 2.7-2.5                       | Possible stromatolites  |

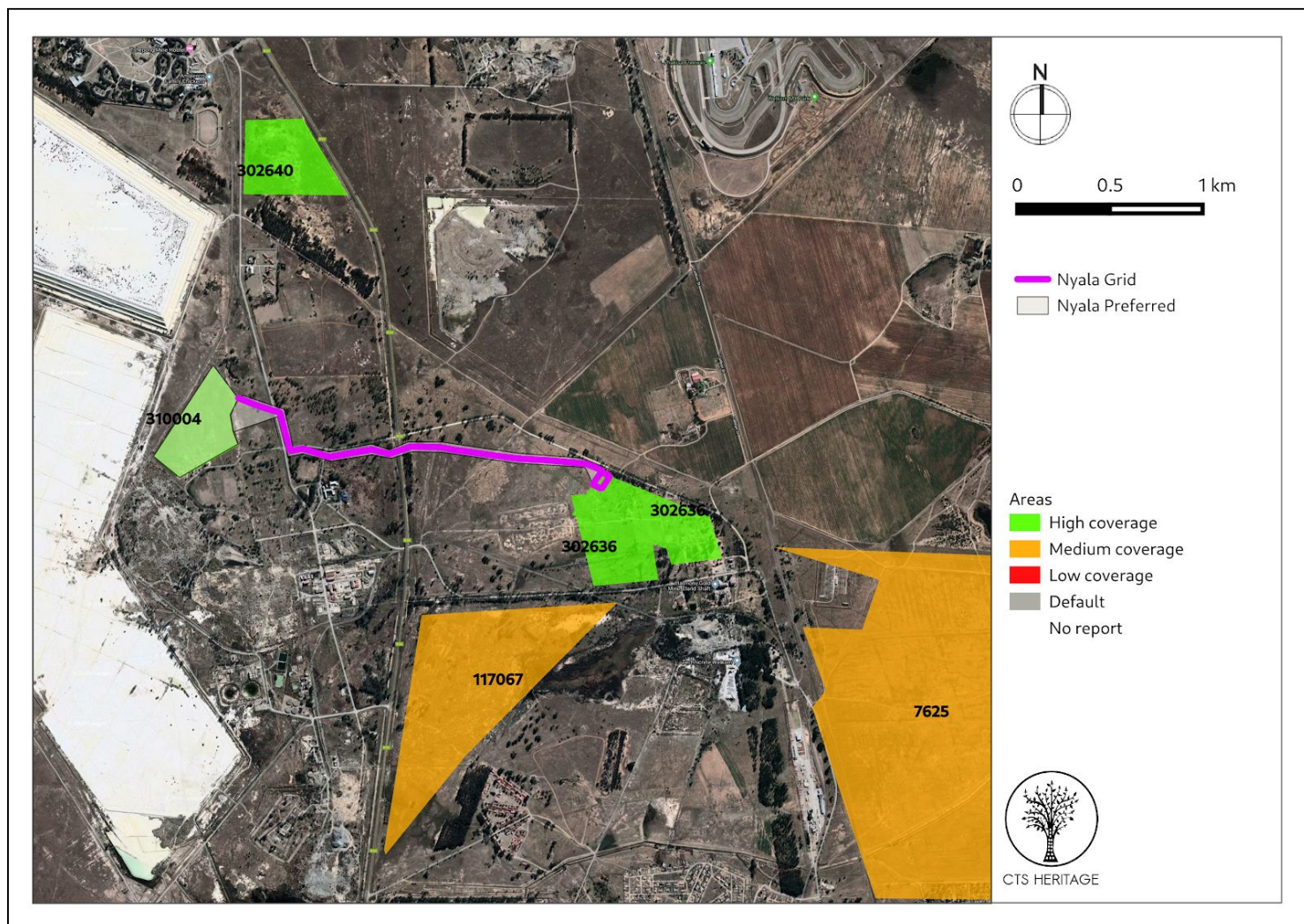


Figure 7: Heritage Assessments and Palaeontology Assessments completed within close proximity to the development area

#### 4.2. Summary of palaeontological resources identified in this area

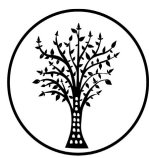
According to the geological map (Figure 5), the area proposed for development is underlain by Quaternary Sands (Qs) and the Volksrust Formation (Pvo).

##### ***Quaternary Sands***

According to the PalaeoBio Database, two plant fossil species have been identified from the St. Helena Gold Mine (Figure 6) which, according to the geological map, is situated within Quaternary Sand sediments. These are *Haplostigma permianica* and *Leptophloeum sanctaehelenae*, and were likely identified from underlying fossiliferous sediments lying below the Quaternary Sands in this area. These two lycopods are known only from the Permian so most certainly are not from the Quaternary period and so most likely from the underlying Vryheid Formation.

##### ***Volksrust Formation***

According to Groenewald (2014), “The overlying Volksrust Formation consists of a monotonous sequence of grey shale and fossils are significant, but rarely recorded. Fossils include rare temnospondyl amphibian remains, invertebrates, minor coals with plant remains, petrified wood, and low-diversity marine to non-marine trace fossil assemblages.”



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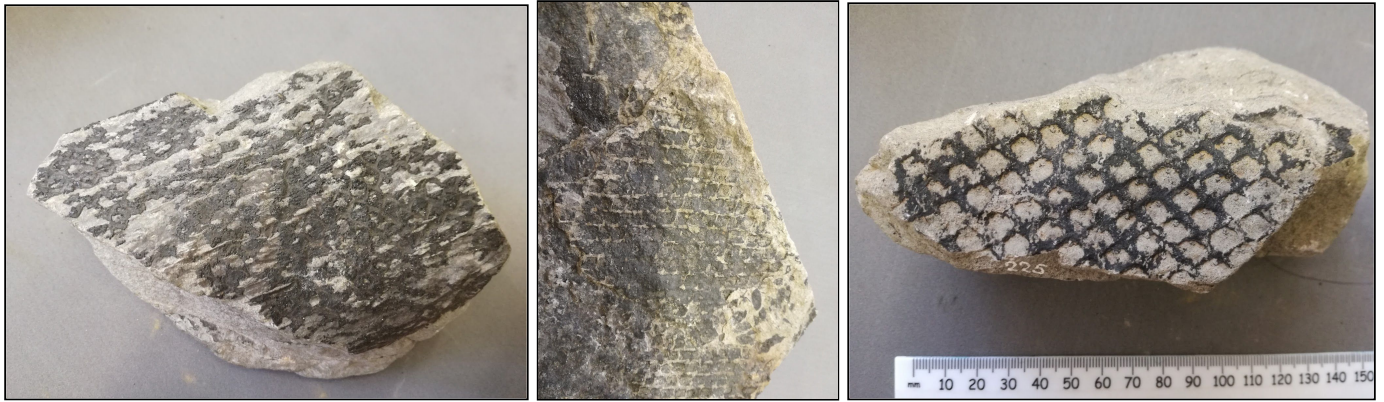


Figure 8: 8.1 - *Haplostigma permianica* fossil 8.2 and 8.3 - *Leptophloeum sanctaehelenae* fossils from St Helena Gold Mine (from M. Bamford)

## 5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

The poor quality coal deposits of the Volksrust Formation are the most palaeontological sensitive sediments within close proximity to the proposed development area. These sediments are located well below the surface, and are overlaid with aeolian Quaternary sand sediments. The proposed infrastructure consists of a 44kV power line, substation and two step-up facilities to connect the authorised Nyala PV Solar Facility to the Eskom grid. This infrastructure will have foundations of a few meters depth only, and as per the recommendations included in Bamford (2015), it is very unlikely that the project will impact on any significant palaeontological material.

## 6. CONCLUSION AND RECOMMENDATIONS

The Nyala PV Solar Facility (Case 7956) was subject to a NEMA Basic Assessment process in 2015. As part of this process, Prof. M. Bamford completed a Desktop Palaeontological Impact Assessment for this proposed PV Facility. SAHRA approved the Desktop Assessment completed by Prof. Bamford in a letter dated 7 July 2015.

Based on the information available in Bamford (2015) as well as the information included in this report, it is very unlikely that the proposed grid connection infrastructure will impact on any significant palaeontological material. However, as per SAHRA's responses in 2015, it is recommended that:

- Should any palaeontological remains be found during construction activities, work must immediately stop in that area and the ECO must be informed. The attached Chance Finds Procedure must be implemented.
- The ECO must inform the South African Heritage Resource Agency (SAHRA) and contact a palaeontologist, to assess the importance of these finds and rescue them if necessary (with the relevant SAHRA permit). No work may be resumed in this area without the permission from the ECO and SAHRA.



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## 7. REFERENCES

| Heritage Impact Assessments |             |                    |            |  |
|-----------------------------|-------------|--------------------|------------|--|
| Nid                         | Report Type | Author/s           | Date       | Title  |
| 7625                        | HIA         | Francois P Coetzee | 01/02/2008 | Cultural Heritage Survey of the Proposed Phakisa Housing Development, Welkom, Free State   |
| 117067                      | HIA         | Frans Prins        | 31/01/2013 | Cultural Heritage Desktop Assessment of the proposed Bio-energy Facility, Harmony Gold Mine , Welkom, Free State Province                    |
| 302636                      | AIA         | Jaco van der Walt  | 17/06/2015 | Archaeological Impact Assessment Report for the Proposed Harmony Gold Eland PV Facility in Welk, Free State Province                         |
| 302640                      | AIA         | Jaco van der Walt  | 17/06/2015 | Archaeological Impact Assessment Report for the Proposed Harmony Gold NyalaPV Facility in Welk, Free State Province                          |
| 310004                      | PIA         | Marion Bamford     | 03/07/2015 | Palaeontological Impact Assessment for three Proposed PV Solar Facilities for Harmony Gold Mining Company, Odendaalsrus, Free State Province |

### Other Reports Referenced:

Anderson, J.M., Anderson, H.M., (1985). Palaeoflora of Southern Africa: Prodrumus of South African megafloras, Devonian to Lower Cretaceous. A.A. Balkema, Rotterdam.

Groenewald, G. (2014). SAHRA PALAEOTECHNICAL REPORT PALAEONTOLOGICAL HERITAGE OF THE FREE STATE.

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<https://sahris.sahra.org.za/heritage-reports/palaeotechnic-report-free-state-province>



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## Appendix 1: Chance Finds Procedure