



**PALAEONTOLOGICAL DESKTOP ASSESSMENT FOR THE KAMEEL FONTEIN
PROSPECTING PROJECT, ON THE REMAINDER OF THE FARM KAMEEL FONTEIN 490,
A PORTION OF THE FARM STRYDFONTEIN 614 AND THE FARM SOETFONTEIN 606,
ZF MGCAWU DISTRICT MUNICIPALITY, NORTHERN CAPE PROVINCE**

Compiled for:

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Prepared by

Banzai Environmental
April 2021

Declaration of Independence

I, Elize Butler, declare that –

General declaration:

- I act as the independent palaeontological specialist in this application.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favorable to the applicant.
- I declare that there are no circumstances that may compromise my objectivity in performing such work.
- I have expertise in conducting palaeontological impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity.
- I will comply with the Act, Regulations and all other applicable legislation.
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application.
- I have no, and will not engage in, conflicting interests in the undertaking of the activity.
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority.
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application.
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favorable to the applicant or not.
- All the particulars furnished by me in this form are true and correct.
- I will perform all other obligations as expected a palaeontological specialist in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realize that a false declaration is an offense in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations.

Palaeontological Desktop Assessment for the proposed Kameel Fontein Prospecting Project on the Remainder of the farm Kameel Fontein 490, a portion of the farm Strydfontein 614 and the farm Soetfontein 606, ZF Mgcawu District Municipality, Northern Cape Province

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SIGNATURE:

A handwritten signature in black ink, appearing to read 'Elize Butler', with a period at the end.

This Palaeontological Impact Assessment report has been compiled considering the National Environmental Management Act 1998 (NEMA) and Environmental Impact Regulations 2014 as amended, requirements for specialist reports, Appendix 6, as indicated in the table below.

Table 1 - NEMA Table

| Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017 | Relevant section in report | Comment where not applicable. |
|--|--|---|
| 1.(1) (a) (i) Details of the specialist who prepared the report | Page ii and Section 2 of Report – Contact details and company and Appendix A | - |
| (ii) The expertise of that person to compile a specialist report including a curriculum vitae | Section 2 – refer to Appendix A | - |
| (b) A declaration that the person is independent in a form as may be specified by the competent authority | Page ii of the report | - |
| (c) An indication of the scope of, and the purpose for which, the report was prepared | Section 4 – Objective | - |
| (cA) An indication of the quality and age of base data used for the specialist report | Section 5 – Geological and Palaeontological history | - |
| (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change; | Section 9 | - |
| (d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment | Desktop Assessment | |
| (e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used | Section 7 Approach and Methodology | - |
| (f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives; | Section 1 and 10 | |
| (g) An identification of any areas to be avoided, including buffers | Section 5 | No buffers or areas of sensitivity identified |

| Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017 | Relevant section in report | Comment where not applicable. |
|--|---|--|
| (h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers; | Section 5 – Geological and Palaeontological history | |
| (i) A description of any assumptions made and any uncertainties or gaps in knowledge; | Section 7.1 – Assumptions and Limitation | - |
| (j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment | Section 1 and 10 | |
| (k) Any mitigation measures for inclusion in the EMPr | Section 1 and 10 | |
| (l) Any conditions for inclusion in the environmental authorisation | Section 11 | |
| (m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation | Section 11 | |
| (n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and | Section 11 | |
| (n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and | | |
| (n)(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan | Section 1 and 10 | - |
| (o) A description of any consultation process that was undertaken during the course of carrying out the study | N/A | Not applicable. A public consultation process will be conducted as part of the EIA and EMPr process. |

| Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017 | Relevant section in report | Comment where not applicable. |
|---|--|--------------------------------------|
| (p) A summary and copies if any comments that were received during any consultation process | N/A | |
| (q) Any other information requested by the competent authority. | N/A | Not applicable. |
| (2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply. | Section 3 compliance with SAHRA guidelines | |

EXECUTIVE SUMMARY

Banzai Environmental was appointed to conduct the Palaeontological Desktop Assessment assessing the proposed Kameel Fontein Prospecting Project on the Remainder of the farm Kameel Fontein 490, a portion of the farm Strydfontein 614 and the farm Soetfontein 606, ZF Mgcawu District Municipality, Northern Cape Province. In agreement with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), a Palaeontological Assessment is necessary to establish if fossil material is present within the planned development. This study is therefore necessary to evaluate the effect on the palaeontological finds.

The study area is underlain by Quaternary surface limestones and windblown sands as well as sediments of the Transvaal Supergroup which include the Ongeluks Formation of the Postmasburg Group, the Danielskuil and Kuruman Formations of the Asbestos Hills Subgroup, Ghaap Group, Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of Quaternary surface limestone is High, while that of the Kuruman and Ongeluk Formations are Moderate, and that of the Danielskuil Formation is Very High. A low significance has been allocated to the proposed development. It is therefore considered that the proposed mining development is deemed appropriate and will not lead to detrimental impacts on the palaeontological resources of the area.

However, if fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation can be carry out by a paleontologist.

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Appendix A: CV

1 INTRODUCTION

Uthondo Lwethu Investments (Pty) Ltd proposes to apply for a Prospecting Right Application for the proposed Kameel Fontein Prospecting Project on the Remainder of the farm Kameel Fontein 490, a portion of the farm Strydfontein 614 and the farm Soetfontein 606. (Figure1-2). The proposed application area will be 2220ha in extent. Prospecting will be conducted for Manganese and Iron ore. This application is for prospecting and does not include mining or development of the site.

2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

This present study has been conducted by Mrs Elize Butler. She has conducted approximately 300 palaeontological impact assessments for developments in the Free State, KwaZulu-Natal, Eastern, Central, and Northern Cape, Northwest, Gauteng, Limpopo, and Mpumalanga. She has an MSc (*cum laude*) in Zoology (specializing in Palaeontology) from the University of the Free State, South Africa and has been working in Palaeontology for more than twenty-five years. She has experience in locating, collecting, and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa (PSSA) since 2006 and has been conducting PIAs since 2014.

3 LEGISLATION

3.1 National Heritage Resources Act (25 of 1999)

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act include **“all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens”**.

Palaeontological heritage is unique and non-renewable and is protected by the NHRA. Palaeontological resources may not be unearthed, broken moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

This Palaeontological Impact Assessment forms part of the Heritage Impact Assessment (HIA) and adhere to the conditions of the Act. According to **Section 38 (1)**, a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length.
- the construction of a bridge or similar structure exceeding 50m in length.

- any development or other activity which will change the character of a site—
 - a. (exceeding 5 000 m² in extent; or
 - b. involving three or more existing erven or subdivisions thereof; or
 - c. involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - d. the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resource authority.
 - e. the re-zoning of a site exceeding 10 000m² in extent.
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

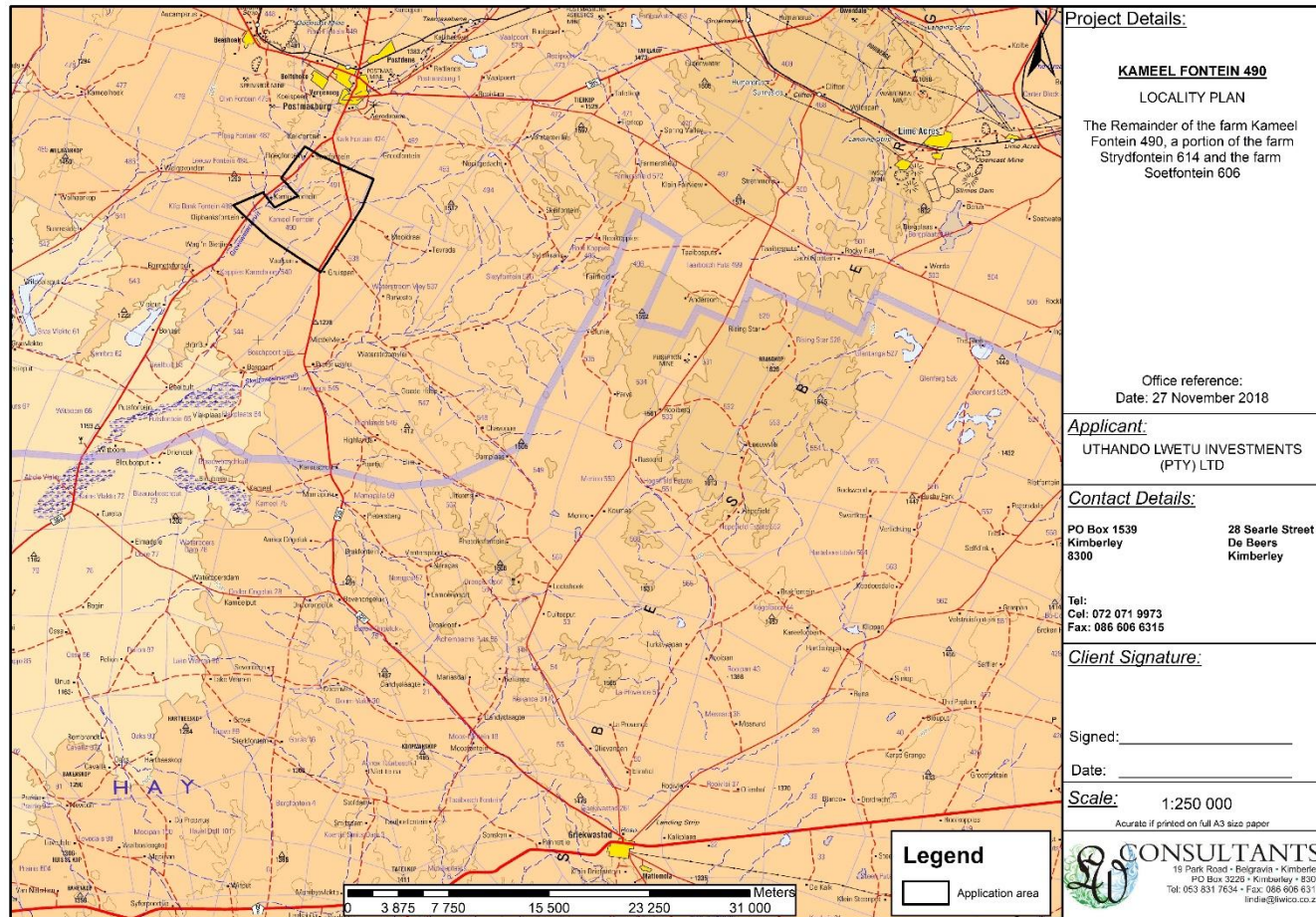


Figure 1: Locality of the proposed Kameel Fontein Prospecting Project on the Remainder of the farm Kameel Fontein 490, a portion of the farm Strydfontein 614 and the farm Soetfontein 606, ZF Mgcawu District Municipality, Northern Cape Province.

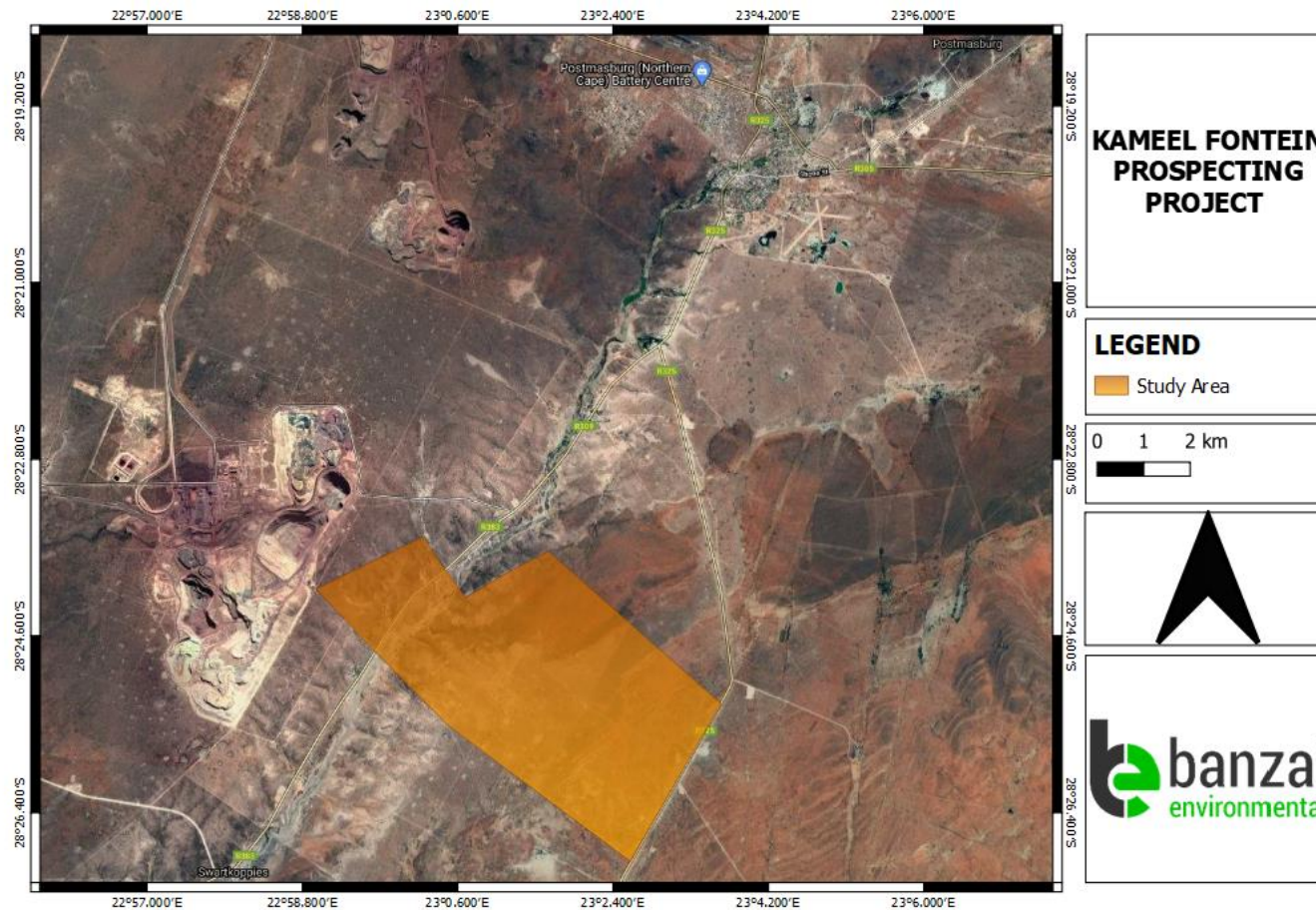


Figure 2: Google Earth Image (2020) indicating the locality (in orange) of the proposed Kameel Fonteijn Prospecting Project on the Remainder of the farm Kameel Fonteijn 490, a portion of the farm Strydfonteijn 614 and the farm Soetfontein 606, ZF Mgcauw District Municipality, Northern Cape Province.

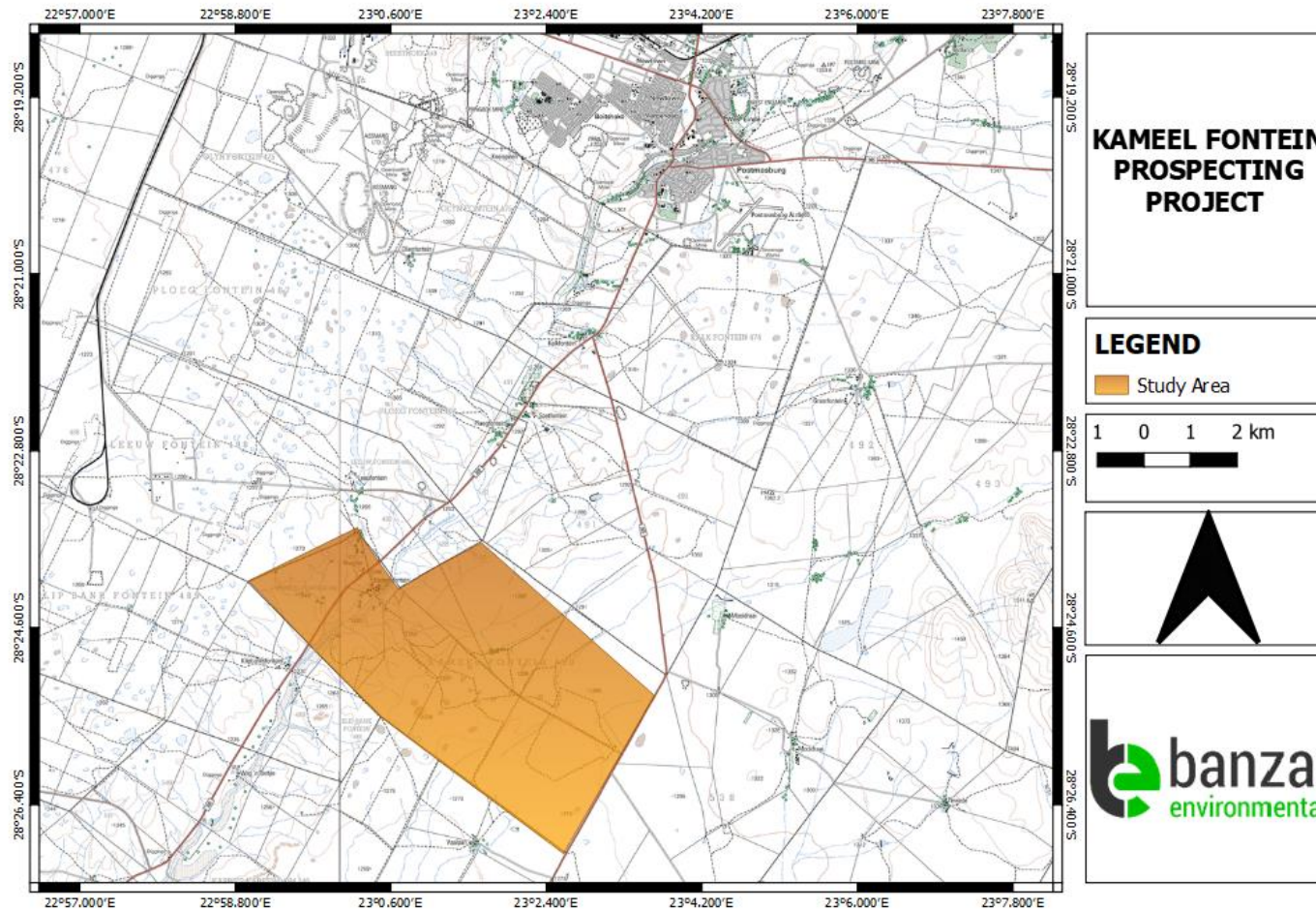


Figure 3: Locality (in orange) of the proposed Kameel Fontein Prospecting Project on the Remainder of the farm Kameel Fontein 490, a portion of the farm Strydfontein 614 and the farm Soetfontein 606, ZF Mgcauw District Municipality, Northern Cape Province.

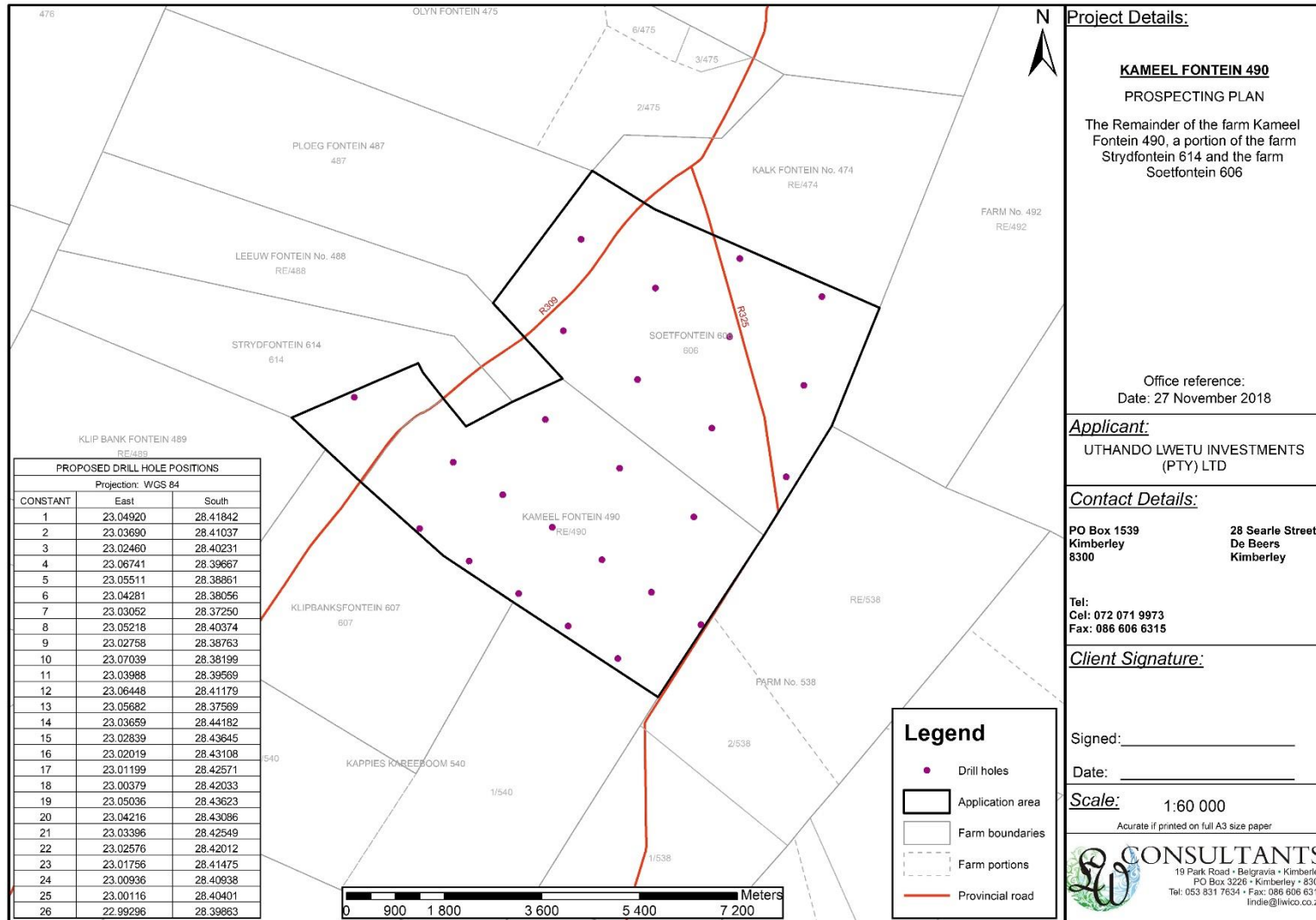


Figure 4: Proposed drill hole positions.

4 OBJECTIVE

The objective of a Palaeontological Impact Assessment (PIA) is to determine the impact of the development on potential palaeontological material at the site.

According to the “SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports” the aims of the PIA are: 1) to **identify** the palaeontological status of the exposed as well as rock formations just below the surface in the development footprint 2) to estimate the **palaeontological importance** of the formations 3) to determine the **impact** on fossil heritage; and 4) to recommend how the developer ought to protect or mitigate damage to fossil heritage.

The terms of reference of a PIA are as follows:

General Requirements:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended.
- Adherence to all applicable best practice recommendations, appropriate legislation and authority requirements.
- Submit a comprehensive overview of all appropriate legislation, guidelines.
- Description of the proposed project and provide information regarding the developer and consultant who commissioned the study.
- Description and location of the proposed development and provide geological and topographical maps.
- Provide Palaeontological and geological history of the affected area.
- Identification sensitive areas to be avoided (providing shapefiles/kmls) in the proposed development.
- Evaluation of the significance of the planned development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
 - a. **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity.
 - b. **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity.
 - c. **Cumulative impacts** are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities.
- Fair assessment of alternatives (infrastructure alternatives have been provided);

- Recommend mitigation measures to minimise the impact of the proposed development; and
- Implications of specialist findings for the proposed development (such as permits, licenses etc).

5 GEOLOGICAL AND PALAEOLOGICAL HISTORY

The proposed Kameel Fontein Prospecting Project is in the Griqualand West Basin and is depicted on the 1:250 000 2822 Postmasburg Geological map (1977) (Council of Geoscience) (Figure 3). This map indicates that the development footprint is underlain by Quaternary surface limestones (QI-light yellow) and windblown sands (dotted light yellow) as well as sediments of the Transvaal Supergroup which include the Ongeluk Formation (Vo) of the Postmasburg Group, the Danielskuil (Vad) and Kuruman (Vak) Formations of the Asbestos Hills Subgroup, Ghaap Group, Transvaal Supergroup (Figure 3). According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of Quaternary surface limestone is High, while that of the Kuruman and Ongeluk Formations are Moderate, and that of the Danielskuil Formation is Very High (Figure 4).

Quaternary deposits are the most widespread body of terrestrial sediments in southern Africa. The sands and calcretes range in thickness from a few metres to more than 180m (Partridge et al., 2006). The fossil assemblages of the Quaternary are generally Low in diversity and occur over a wide range. These fossils represent terrestrial plants and animals with a close resemblance to living forms. Fossil assemblages include bivalves, diatoms, gastropod shells, ostracods and trace fossils. The palaeontology of the Quaternary superficial deposits has been relatively neglected in the past. Late Cenozoic calcrete may comprise of bones, horn cores as well as mammalian teeth. Tortoise remains have also been uncovered as well as trace fossils which includes termite and insect's burrows and mammalian trackways. Amphibian and crocodile skeletons have been uncovered where the depositional settings in the past were wetter.

The Transvaal Supergroup is preserved in three structural basins on the Kaapvaal Craton of South Africa namely the Griqualand West Basin, Transvaal Basin, as well as the Kanye Basin in Botswana. The Griqualand West Basin can be subdivided into the Ghaap Plateau and Prieska sub basins. The geometry of the three basins is mostly stratiform with the exclusion of the volcanic precursor of the Kanye Basin and parts of the Griqualand West Basin. Extensive deformation has taken place in the south-western portion of the Griqualand West Basin.

The **Griqualand West Basin in the** Northern Cape Province consists of clastic sediments as well as volcanic rocks, diamictites and banded iron formations. The Griquatown Group is divided into two formations namely the Asbestos Hills and Koegas Formations. The Daniëlskuil Formation of the Asbestos Hill Subgroup overlies the Kuruman Formation. The Asbestos Hills Subgroup consist mostly of Banded Ironstone Formation (BIF) which is subdivided into an upper allochemical, clastic-textured Daniëlskuil Formation (Beukes, 1983) and lower orthochemical, rhythmically banded Kuruman Formation. This transition signifies the flooding of the platform (Klein and Beukes, 1989; Sumner and Grotzinger, 2004). The Kuruman Formation forms the deeper-water banded chert and iron formation at the base, moving to the shallow-water granular iron formation of the Daniëlskuil Formation (Beukes, 1984). Sediments of the Daniëlskuil Formation are currently believed to be reworked Kuruman-type BIF. The sediments have been reworked by waves or currents of shallow-water, storm-dominated epeiric sea and are granular in texture, while the underlying Kuruman Formation sediments are finely laminated that were set down deeper in the basin (Beukes, 1983; Eriksson et al., 2009). The Asbestos Hills Subgroup comprises of a series of thin alternating deposits of dark ferruginous (magnetite, hematite and limonite) jaspilite and light-colored chert and jasper. In some areas thin layers of riebeckite-amphibolite and shale are present (Eriksson et al., 2009). The Asbestos Hills Subgroup conformably overlie the dolomitic limestone of the Cambellrand Subgroup that outcrops northeast of the study site.

Microfossils have been described from the chert layers in the Kuruman Formation (Tankard *et al.*, 1982; MacRae, 1999). It is thus it is probable that microfossils are also present in the cherts from the Daniëlskuil Formation (Almond & Pether, 2008).

Microfossils have been described from the chert layers in the Kuruman Formation (Tankard *et al.*, 1982; MacRae, 1999). It is thus it is probable that microfossils are also present in the cherts from the Daniëlskuil Formation (Almond & Pether, 2008).

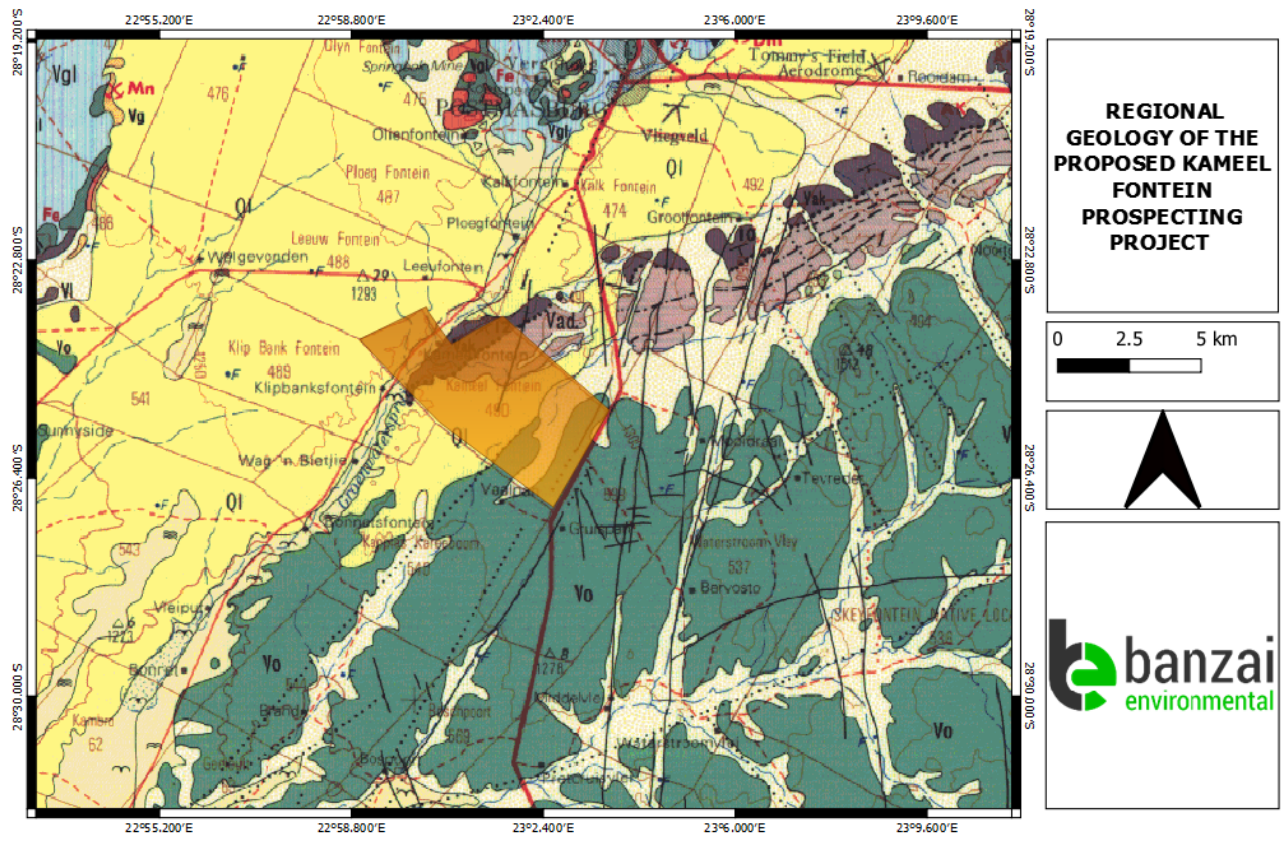


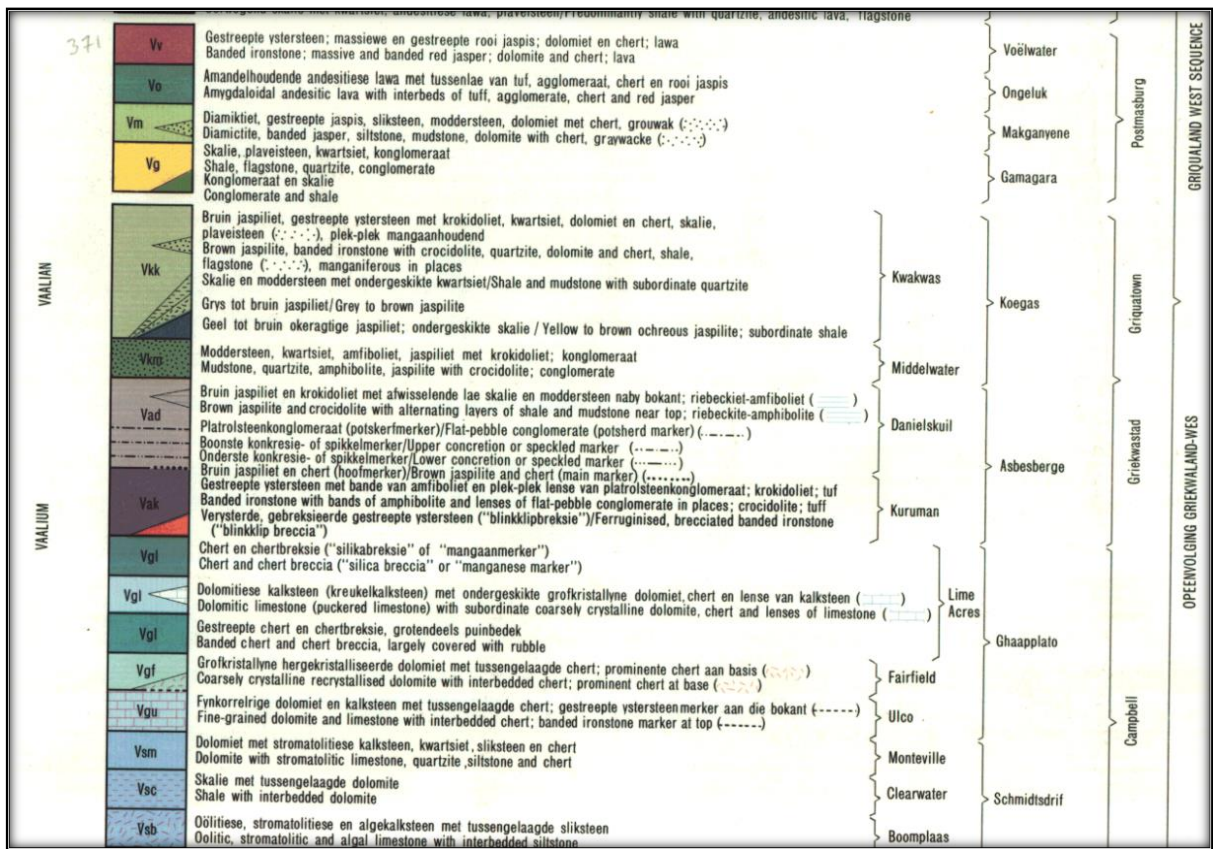
Figure 5: Extract of the 1:250 000 2822 Postmasburg Geological map (1977) (Council of Geoscience, Pretoria) indicating the proposed development in orange. Surface geology indicates that the development footprint is underlain by the Quaternary surface limestones and windblown sand as well as sediments of the Transvaal Supergroup.

GEOLOGIESE LEGENDE

GEOLOGICAL LEGEND

LID MEMBER

| | | |
|---|----|---|
| TERSIER TOT KWATERNÊR TERTIARY TO QUATERNARY | Qw | Wit tot vleeskleurige sand ("brulsand") White to flesh-coloured sand ("roaring sand") |
| | Qs | Rooi tot vleeskleurige waaisand; sandduin () Red to flesh-coloured wind-blown sand; sand dune () |
| | A | Alluvium Alluvium |
| | V | Verweringspuin Rubble |
| | R | Rivierterrasgruis River-terrace gravel |
| | H | Hoëterrasgruis High terrace gravel |
| | Ql | Oppervlakkalksteen Surface limestone |



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Table 2: Legend to Map and short explanation (Modified from the 1:250 000 2822 Postmasburg Geological map (1977) (Council of Geoscience, Pretoria).

| Symbol | Lithology | Stratigraphy | | Age |
|--------------------------|---|---|--|---|
| Qs High | Red so flesh-coloured wind-blown sand | | | Quaternary |
| Ql | Surface limestone | | | |
| Vo | Amygdaloidal andesitic lava with interbeds of tuff, agglomerate, chert and red jasper | Ongeluk Fm | Postmasburg Group Asbestos Hills Subgroup; Ghaap Group | Transvaal / Griqualand West Supergroup Vaalian (±2.50–2.05 Ga) |
| Vad | Yellow-brown jaspilite and crocidolite with alternating layers of shale and mudstone near top | Danielskuil/ Griquatown Formation | | |
| Vak | Banded ironstone with bands of amphibolite and lenses of conglomerate, crocidolite, tuff | Kuruman Formation | | |
| Vgl | Dolomitic limestone with subordinate coarsely crystalline dolomite, chert and lenses of limestone | Lime Acres Member of the Ghaap Plateau Dolomite of the Cambellrand Subgroup | | |

Algal growth structures, also known as “Stromatolites”, are fossil structures described from the dolomites of the Transvaal Supergroup. Stromatolites are layered mounds, columns and sheet-like sedimentary rocks. These structures were originally formed by the growth of layer upon layer of cyanobacteria, a single-celled photosynthesizing microbe. Cyanobacteria are prokaryotic cells (simplest form of modern carbon-bases life). Stromatolites are first found in Precambrian rocks and are known as the earliest known fossils. The oxygen atmosphere that we depend on was generated by numerous cyanobacteria photosynthesizing during the Archaean and Proterozoic Era.



Figure 6: Example of a well-preserved stromatolite from the Archaean Era

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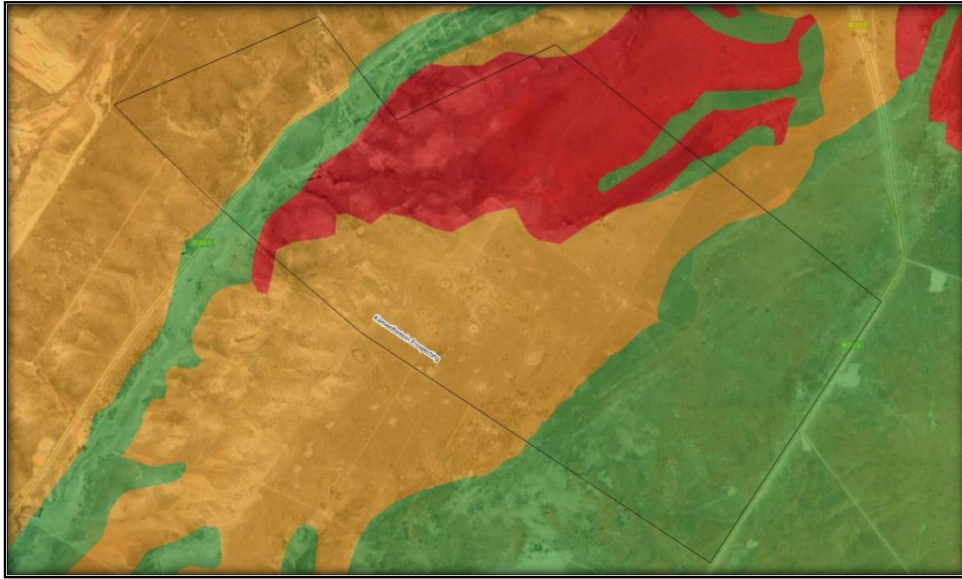


Figure 7: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences). Location of the proposed development is indicated in brown.

| Colour | Sensitivity | Required Action |
|---------------|--------------------|---|
| RED | VERY HIGH | field assessment and protocol for finds is required |
| ORANGE/YELLOW | HIGH | desktop study is required and based on the outcome of the desktop study; a field assessment is likely |
| GREEN | MODERATE | desktop study is required |
| BLUE | LOW | no palaeontological studies are required however a protocol for finds is required |
| GREY | INSIGNIFICANT/ZERO | no palaeontological studies are required |
| WHITE/CLEAR | UNKNOWN | these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map. |

According to the SAHRIS Palaeosensitivity map (Figure 4) there is a moderate chance (green), High (orange) and Very High (red) of finding fossils in this area.

6 GEOGRAPHICAL LOCATION OF THE SITE

The proposed Kameel Fontein Prospecting Project on the Remainder of the farm Kameel Fontein 490, a portion of the farm Strydfontein 614 and the farm Soetfontein 606, ZF Mgcawu District Municipality, Northern Cape Province is approximately 10km south of the town Postmasburg on the R383.

7 METHODS

The aim of a desktop study is to evaluate the risk to palaeontological heritage in the proposed development. This includes all trace fossils and fossils. All available information is consulted to compile a desktop study and includes: Palaeontological Impact Assessment reports in the same area; aerial photos and Google Earth images, topographical as well as geological maps.

7.1 Assumptions and Limitations

The focal point of geological maps is the geology of the area and the sheet explanations were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have never been reviewed by palaeontologists and data is generally based on aerial photographs alone. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.

Comparable Assemblage Zones in other areas is sourced to provide information on the existence of fossils in an area which was not documented in the past. When using similar Assemblage Zones and geological formations for Desktop studies it is generally **assumed** that exposed fossil heritage is present within the footprint. **A field-assessment will thus improve the accuracy of the desktop assessment.**

8 ADDITIONAL INFORMATION CONSULTED

In compiling this report the following sources were consulted:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984),
- 1: 250 000 2822 Postmasburg Geological map (1977) (Council of Geoscience, Pretoria),
- A Google Earth map with polygons of the proposed development was obtained from Uthondo Lwethu Investments,

9 IMPACT ASSESSMENT METHODOLOGY

Impact assessment ratings are generally done using the Plomp impact assessment matrix scale. According to this matrix scale, each receptor in the study area is given an impact assessment. The significances of the impacts were determined through a synthesis of the criteria below:

Table 3: Impacts

| | |
|---|--|
| Probability: This describes the likelihood of the impact actually occurring. | |
| Improbable: | The possibility of the impact occurring is very low, due to the circumstances, design or experience. |
| Probable: | There is a probability that the impact will occur to the extent that provision must be made therefore. |
| Highly Probable | It is most likely that the impact will occur at some stage of the development. |
| Definite: | The impact will take place regardless of any prevention plans, and there can only be relied on mitigatory actions or contingency plans to contain the effect. |
| Duration: The lifetime of the impact | |
| Short term: | The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases. |
| Medium term: | The impact will last up to the end of the phases, where after it will be negated. |
| Long term: | The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter. |
| Permanent: | Impact that will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient. |
| Scale: The physical and spatial size of the impact | |
| Local: | The impacted area extends only as far as the activity, e.g. footprint |
| Site: | The impact could affect the whole, or a measurable portion of the above mentioned properties. |
| Regional: | The impact could affect the area including the neighbouring residential areas. |
| Magnitude/ Severity: Does the impact destroy the environment, or alter its function. | |
| Low: | The impact alters the affected environment in such a way that natural processes are not affected. |
| Medium: | The affected environment is altered, but functions and processes continue in a modified way. |
| High: | Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases. |
| Significance: This is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. | |

| | |
|-------------|--|
| Negligible: | The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored. |
| Low: | The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs. |
| Moderate: | The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required. |
| High: | The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation. |

The following weights were assigned to each attribute:

| <i>Aspect</i> | <i>Description</i> | <i>Weight</i> |
|---------------------------|---|---------------|
| <i>Probability</i> | <i>Improbable</i> | 1 |
| | <i>Probable</i> | 2 |
| | <i>Highly Probable</i> | 4 |
| | <i>Definite</i> | 5 |
| <i>Duration</i> | <i>Short term</i> | 1 |
| | <i>Medium term</i> | 3 |
| | <i>Long term</i> | 4 |
| | <i>Permanent</i> | 5 |
| <i>Scale</i> | <i>Local</i> | 1 |
| | <i>Site</i> | 2 |
| | <i>Regional</i> | 3 |
| <i>Magnitude/Severity</i> | <i>Low</i> | 2 |
| | <i>Medium</i> | 6 |
| | <i>High</i> | 8 |
| <i>Significance</i> | <i>Sum (Duration, Scale, Magnitude) x Probability</i> | |
| | <i>Negligible</i> | <20 |
| | <i>Low</i> | <40 |
| | <i>Moderate</i> | <60 |
| | <i>High</i> | >60 |

The significance of each activity is rated without mitigation measures and with mitigation measures for both construction and operational phases of the development.

Table 4: Impact rating

| | Activity | Without or With Mitigation | Probability | Duration | Scale | Magnitude/ Severity | Significance | Score |
|-----------------------------|------------|----------------------------|----------------|---------------|----------|---------------------|--------------|-------|
| Planning Phase | N/A | | | | | | | |
| Construction Phase | | WOM | Probable (2) | Permanent (5) | Site (1) | Medium (6) | Low | 24 |
| | | WM | Improbable (1) | Permanent (5) | Site (1) | Low (2) | Negligible | 8 |
| Operational Phase | N/A | | | | | | | |
| Closure and decommissioning | N/A | | | | | | | |
| Post closure phase | N/A | | | | | | | |

10 FINDINGS AND RECOMMENDATIONS

The study area is underlain by Quaternary surface limestones and windblown sands as well as sediments of the Transvaal Supergroup which include the Ongeluk Formation of the Postmasburg Group, the Danielskuil and Kuruman Formations of the Asbestos Hills Subgroup, Ghaap Group, Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of Quaternary surface limestone is High, while that of the Kuruman and Ongeluk Formations are Moderate, and that of the Danielskuil Formation is Very High. A low significance has been allocated to the proposed development. It is therefore considered that the proposed mining development is deemed appropriate and will not lead to detrimental impacts on the palaeontological resources of the area.

However, if fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation can be carry out by a paleontologist.

11 CHANCE FINDS PROTOCOL

A following procedure will only be followed if fossils are uncovered during excavation.

11.1 Legislation

Cultural Heritage in South Africa (includes all heritage resources) is protected by the **National Heritage Resources Act (Act 25 of 1999) (NHRA)**. According to Section 3 of the Act, all Heritage resources include “**all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens**”.

Palaeontological heritage is unique and non-renewable and is protected by the NHRA and are the property of the State. It is thus the responsibility of the State to manage and conserve fossils on behalf of the citizens of South Africa. Palaeontological resources may not be excavated, broken, moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

11.2 Background

A fossil is the naturally preserved remains (or traces) of plants or animals embedded in rock. These plants and animals lived in the geologic past millions of years ago. Fossils are extremely rare and irreplaceable. By studying fossils, it is possible to determine the environmental conditions that existed in a specific geographical area millions of years ago.

11.3 Introduction

This informational document is intended for workmen and foremen on construction sites. It describes the actions to be taken when mining or construction activities accidentally uncovers fossil material.

It is the responsibility of the Environmental Site Officer (ESO) or site manager of the project to train the workmen and foremen in the procedure to follow when a fossil is accidentally uncovered. In the absence of the ESO, a member of the staff must be appointed to be responsible for the proper implementation of the chance find protocol as not to compromise the conservation of fossil material.

11.4 Chance Find Procedure

- If a chance find is made the person responsible for the find must immediately **stop working** and all work that could impact that finding must cease in the immediate vicinity of the find.
- The person who made the find must immediately **report** the find to his/her direct supervisor which in turn must report the find to his/her manager and the ESO or site manager. The ESO or site manager must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.
- A preliminary report must be submitted to the Heritage Agency within **24 hours** of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.
- Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.

Upon receipt of the preliminary report, the Heritage Agency will inform the ESO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.

- The site must be secured to protect it from any further damage. **No attempt** should be made to remove material from their environment. The exposed finds must be stabilized and covered by a plastic sheet or sand bags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.
- In the event that the fossil cannot be stabilized the fossil may be collected with extreme care by the ESO (site manager). Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.
- Once Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area.

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Appendix A – Elize Butler CV

CURRICULUM VITAE

ELIZE BUTLER

PROFESSION: Palaeontologist

YEARS' EXPERIENCE: 26 years in Palaeontology

EDUCATION: B.Sc Botany and Zoology, 1988
University of the Orange Free State

B.Sc (Hons) Zoology, 1991
University of the Orange Free State

Management Course, 1991
University of the Orange Free State

M. Sc. *Cum laude* (Zoology), 2009
University of the Free State

Dissertation title: The postcranial skeleton of the Early Triassic non-mammalian Cynodont *Galesaurus planiceps*: implications for biology and lifestyle

Registered as a PhD fellow at the Zoology Department of the UFS

2013 to current

Dissertation title: A new gorgonopsian from the uppermost *Daptocephalus Assemblage Zone*, in the Karoo Basin of South Africa

MEMBERSHIP

Palaeontological Society of South Africa (PSSA) 2006-currently

EMPLOYMENT HISTORY

Part-time Laboratory assistant Department of Zoology & Entomology
University of the Free State Zoology 1989-1992

Part-time laboratory assistant Department of Virology
University of the Free State Zoology 1992

Research Assistant National Museum, Bloemfontein 1993 – 1997

Principal Research Assistant National Museum, Bloemfontein
and Collection Manager 1998–currently

TECHNICAL REPORTS

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