

**PALAEONTOLOGICAL FIELD ASSESSMENT OF THE FILLING STATION (RIETVLEI EXTENSION
6) ON THE REMAINING PORTION OF PORTION 1 OF THE FARM WITKOPPIES 393JR EAST
OF THE RIETVLEIDAM NATURE RESERVE, CITY OF TSHWANE, GAUTENG**

CaseID: 13510

Compiled for:

Bokamoso Landscape Architects & Environmental Consultants CC
PO Box 11375
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08 May 2018

Prepared by:

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Declaration of Independence

General declaration:

- I, Elize Butler, declare that –
- I act as the independent Palaeontologist 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 favourable 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 favourable 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 from a heritage practitioner in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence 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;

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SIGNATURE:



The Palaeontological Impact Assessment report has been compiled taking into account the NEMA Appendix 6 requirements for specialist reports as indicated in the table below.

Table 1: Nema Requirements

| NEMA Regs (2014) - Appendix 6 | Relevant section in report |
|---|--|
| 1. (1) A specialist report prepared in terms of these Regulations must contain- | |
| a) details of- <ul style="list-style-type: none"> i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae; | Page ii of Report – Contact details and company and Appendix 1 |
| b) a declaration that the specialist is independent in a form as may be specified by the competent authority; | Page ii-iii |
| 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 10 – Impacts |
| d) the date, duration and season of the site investigation and the relevance of the season to the outcome of the assessment; | Section 9 – Site visit |
| 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 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, Section 5 |
| g) an identification of any areas to be avoided, including buffers; | N/A |
| 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 |
| 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 or activities; | Section 11 |
| k) any mitigation measures for inclusion in the EMPr; | Section 11, Section 12 |
| l) any conditions for inclusion in the environmental authorisation; | N/A |
| m) any monitoring requirements for inclusion in the EMPr or environmental authorisation; | N/A |

| | |
|---|---|
| <p>n) a reasoned opinion-</p> <ul style="list-style-type: none"> i. as to whether the proposed activity, activities or portions thereof should be authorised; <ul style="list-style-type: none"> (iA) regarding the acceptability of the proposed activity or activities; and 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; | <p>Saction1, Section 11</p> |
| <p>o) a description of any consultation process that was undertaken during the course of preparing the specialist report;</p> | <p>Not applicable.</p> |
| <p>p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and</p> | <p>Not applicable. To date not comments regarding heritage resources that require input from a specialist have been raised.</p> |
| <p>q) any other information requested by the competent authority.</p> | <p>Not applicable.</p> |
| <p>2) Where a government notice <i>gazetted</i> 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.</p> | <p>Refer to section 2 and 3 compliance with SAHRA guidelines</p> |

EXECUTIVE SUMMARY

Bokamoso Landscape Architects & Environmental Consultants CC appointed Banzai Environmental to conduct the Palaeontological Impact Assessment for the proposed filling station (Rietvlei Extension 6) on the Remaining Portion of Portion 1 of the Farm Witkoppies 393 JR east of the Rietvleidam Nature Reserve, City of Tshwane, Gauteng. The National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), states that a Palaeontological Impact Assessment (PIA) is key to detect the presence of fossil material within the planned development footprint. This Impact Assessment is thus necessary to evaluate the effect of the construction on the palaeontological resources.

The development footprint is totally underlain by Precambrian dolomites and associated marine sedimentary rocks that are allocated to the Malmani Subgroup (Chuniespoort Group) within the Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Malmani Subgroup is Very High (Almond and Pether 2008, SAHRIS website). During a field survey of the proposed development footprint, no fossiliferous outcrops were found. For this reason, a **low palaeontological sensitivity** is allocated to the development footprint. Thus, the **construction of the development may be authorised in its whole extent**, as the development footprint is not considered sensitive in terms of palaeontological resources.

In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations the **Chance Find Protocol** must be implemented by the ECO in charge of these developments. These discoveries ought to be protected (if possible *in situ*) 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 correct mitigation (e.g. recording and collection) can be carry out by a paleontologist.

Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA.

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1 INTRODUCTION

Bokamoso Landscape Architects & Environmental Consultants CC appointed Banzai Environmental to conduct the Palaeontological Impact Assessment for the proposed filling station (Rietvlei Extension 6) on the Remaining Portion of Portion 1 of the Farm Witkoppies 393 JR east of the Rietvleidam Nature Reserve, City of Tshwane, Gauteng. The proposed development will consist of a filling station, convenience store and parking for busses and trucks. In the past the proposed development was used for agricultural purposes (Figure 1-2).



Figure 1: Google Earth (2018) image of the proposed Rietvlei filling station (indicated in white) on the Remaining Portion of Portion 1 of the Farm Witkoppies 393 JR east of the Rietvleidam Nature Reserve, City of Tshwane, Gauteng. Scale bar represents 1471 m

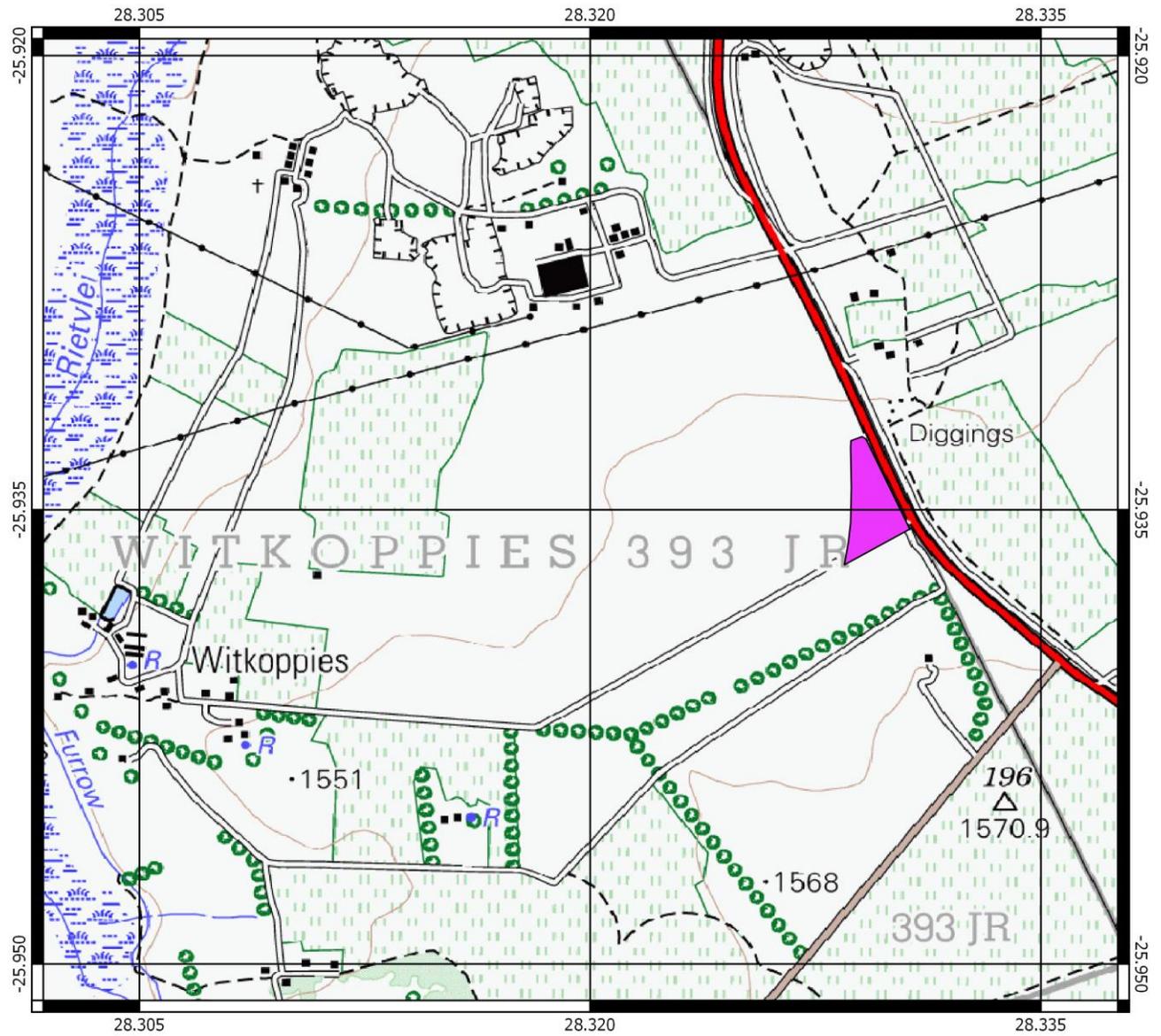


Figure 2: Extract of the 1: 50 000 Topographical map (2528 CD) of the proposed Rietvlei filling station (indicated in purple) on the Remaining Portion of Portion 1 of the Farm Witkoppies 393 JR east of the Rietvleidam Nature Reserve, City of Tshwane, Gauteng.

2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty-four years. She has extensive 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 for 13 years. She 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 DIA forms part of the Heritage Impact Assessment (HIA) and adhere to the conditions of the Act. According to **Section 38 (1)**, an 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 300 m in length;
- the construction of a bridge or similar structure exceeding 50 m in length;
- any development or other activity which will change the character of a site—
 - (exceeding 5 000 m² in extent; or
 - involving three or more existing erven or subdivisions thereof; or
 - involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- the re-zoning of a site exceeding 10 000 m² in extent;
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

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 HERITAGE

The development footprint is totally underlain by Precambrian dolomites and associated marine sedimentary rocks that are allocated to the Malmani Subgroup (Chuniespoort Group) within the Transvaal Supergroup (Figure 3).

The Malmani Subgroup platform carbonates of the Transvaal Basin comprise of an assortment of stromatolites (microbial laminites), ranging from supratidal mats to intertidal columns and large subtidal domes (Eriksson *et al.* 2006).

Stromatolites are layered mounds, columns and sheet-like sedimentary rocks (Figure 4). 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.

Stromatolites and oolites from the Transvaal Supergroup have been described by various authors (Eriksson and Altermann, 1998). Detailed descriptions of South African Archaean stromatolites are available in the literature (Altermann, 2001; Buick, 2001; and Schopf, 2006). Literature on the Malmani stromatolites, includes articles by Button (1973), Truswell and Eriksson (1972, 1973, 1975), Eriksson and MacGregor (1981), Eriksson and Altermann (1998), Sumner (2000), Schopf (2006).

The Malmani Subgroup succession is approximately 2 km-thick and consists of a series of formations of stromatolitic and oolitic carbonates (limestones and dolomites), minor secondary cherts and black carbonaceous shales.

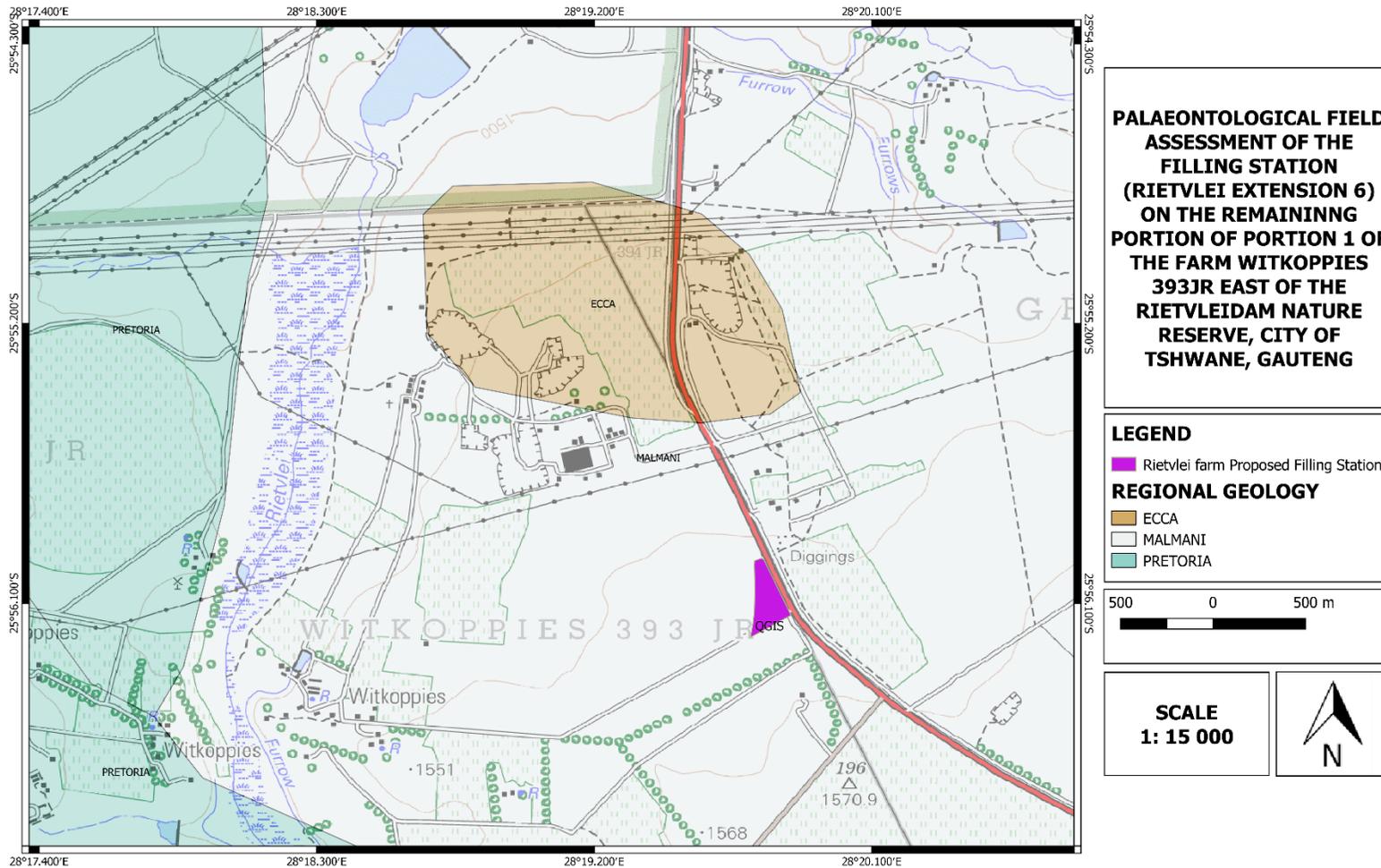


Figure 3: Surface geology of the proposed proposed Rietvlei filling station (indicated in white) on the Remainingg Portion of Portion 1 of the Farm Witkoppies 393 JR east of the Rietvleidam Nature Reserve, City of Tshwane is entirely underlain by the Malmani Subgroup (Chuniespoort Group; Transvaal Supergroup). Map drawn QGIS Desktop 2.18.18.



Figure 4: Example of a well preserved stromatolite from the Archaean Era.

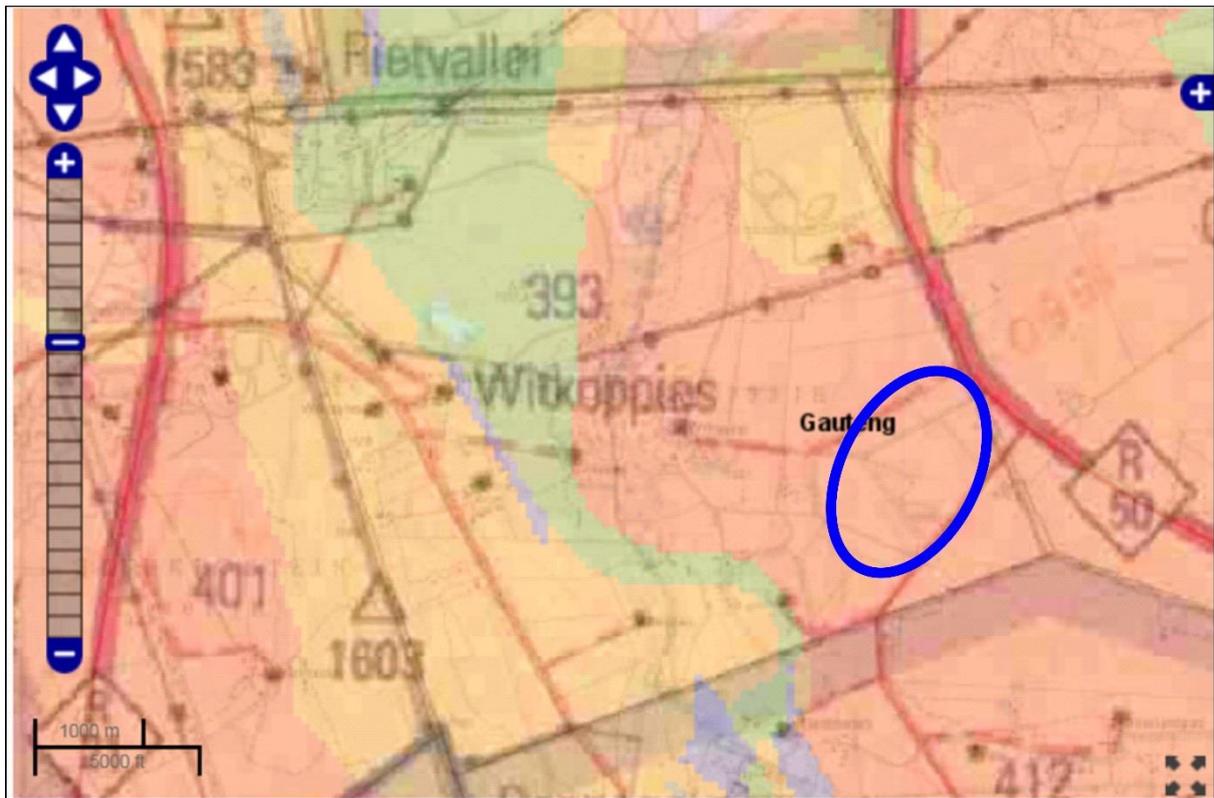


Figure 5: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences). Approximate location of the proposed development is indicated in blue

| 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 5) there is very high chance of finding fossils in this area.

6 GEOGRAPHICAL LOCATION OF THE SITE

The proposed filling station (Rietvlei Extension 6) is located on the Remaining Portion of Portion 1 of the Farm Witkoppies 393 JR east of the Rietvleidam Nature Reserve, City of Tshwane, Gauteng. The proposed development site is situated to the west of the Delmas Road (R50) and approximately 2 km east of the Rietvlei Dam Nature Reserve.

The boundaries of the proposed development is:

- 25°55'57.35"S 28°19'44.58"E
- 25°55'57.85"S 28°19'43.16"E
- 25°56'7.81"S 28°19'50.15"E
- 25°56'12.03"S 28°19'42.66"E

7 METHODS

As part of the Palaeontological Impact Assessment, a one day field-survey of the project site and power line corridor was conducted on the weekend of the 27nd of April 2019 to assess the potential risk to palaeontological material (fossil and trace fossils) in the proposed footprint of the development. A physical field-survey was conducted on foot and by vehicle within the proposed project site as well as all proposed alternatives. The results of the field-survey, the author's experience, aerial photos (using Google Earth, 2018), topographical and geological maps were used to assess the proposed development footprint. No consultations were undertaken for this Impact Assessment.

7.1 Assumptions and limitations

The accuracy of Desktop Palaeontological Assessment is reduced by several factors which may include the following: the databases of institutions are not always up to date and relevant locality and geological information were not accurately documented in the past. Various remote areas of South Africa have not been assessed by palaeontologists and data is based on aerial photographs alone. Geological maps concentrate on the geology of an area and the sheet explanations were never intended to focus on palaeontological heritage.

Similar Assemblage Zones, but in different areas is used to provide information on the presence of fossil heritage in an unmapped area. Desktop studies of similar geological formations and Assemblage Zones generally **assume** that exposed fossil heritage is present within the development area. The accuracy of the Palaeontological Impact Assessment is thus improved considerably by conducting a field-assessment.

8 ADDITIONAL INFORMATION CONSULTED

In compiling this report the following sources were consulted:

- The Palaeosensitivity Map from the SAHRIS website.
- 1: 50 000 Topographical map 2528 CD Rietvleidam
- A Google Earth map with polygons of the proposed development was obtained from Bokamoso Landscape Architects & Environmental Consultants CC
- HIA for the Rietvlei Extension 6 filling station
Pelser, A. 2019. Phase 1 report for a filling station (Rietvlei Extension 6) on the Remaining Portion of Portion 1 of the Farm Witkoppies 393JR east of the Rietvleidam Nature Reserve, City of Twane, Gauteng.

9 SITE VISIT

The following photographs were taken during the site visit to the proposed project site of the proposed filling station (Rietvlei Extension 6) is located on the Remaining Portion of Portion 1 of the Farm Witkoppies 393 JR east of the Rietvleidam Nature Reserve, City of Tshwane, Gauteng. No fossiliferous outcrop was identified during the site investigation.



Figure 6: Photo taken from north-eastern border, overlooking the proposed Rietvlei filling station development. No outcrops were identified during the field visit. Location of the development 25° 55' 57" S 28° 19' 43" E



Figure 7: Flat topography of the proposed Rietvlei filling station development. Location of the development 25° 56' 067" S 28° 19' 49" E



Figure 8: Grassy vegetation on the proposed Rietvlei filling station development. Location of the development 25° 56' 067" S 28° 19' 49" E

10 IMPACT ASSESSMENT METHODOLOGY

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the following project phases:

- Construction
- Operation
- Decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact the following criteria is used:

Table 2: The rating system

| NATURE |
|--|
| Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity. |

| | | |
|---|----------------------------|---|
| The Nature of the Impact is the possible destruction of fossil heritage | | |
| GEOGRAPHICAL EXTENT | | |
| This is defined as the area over which the impact will be experienced. | | |
| 1 | Site | The impact will only affect the site. |
| 2 | Local/district | Will affect the local area or district. |
| 3 | Province/region | Will affect the entire province or region. |
| 4 | International and National | Will affect the entire country. |
| PROBABILITY | | |
| This describes the chance of occurrence of an impact. | | |
| 1 | Unlikely | The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence). |
| 2 | Possible | The impact may occur (Between a 25% to 50% chance of occurrence). |
| 3 | Probable | The impact will likely occur (Between a 50% to 75% chance of occurrence). |
| 4 | Definite | Impact will certainly occur (Greater than a 75% chance of occurrence). |
| DURATION | | |
| This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity. | | |
| 1 | Short term | The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years). |
| 2 | Medium term | The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years). |
| 3 | Long term | The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years). |
| 4 | Permanent | The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite. |
| INTENSITY/ MAGNITUDE | | |
| Describes the severity of an impact. | | |
| 1 | Low | Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible. |
| 2 | Medium | Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity). |

| | | |
|---|-----------|--|
| 3 | High | Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation. |
| 4 | Very high | Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation. |

REVERSIBILITY

This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.

| | | |
|---|-----------------------|--|
| 1 | Completely reversible | The impact is reversible with implementation of minor mitigation measures. |
| 2 | Partly reversible | The impact is partly reversible but more intense mitigation measures are required. |
| 3 | Barely reversible | The impact is unlikely to be reversed even with intense mitigation measures. |
| 4 | Irreversible | The impact is irreversible and no mitigation measures exist. |

IRREPLACEABLE LOSS OF RESOURCES

This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.

| | | |
|---|-------------------------------|---|
| 1 | No loss of resource | The impact will not result in the loss of any resources. |
| 2 | Marginal loss of resource | The impact will result in marginal loss of resources. |
| 3 | Significant loss of resources | The impact will result in significant loss of resources. |
| 4 | Complete loss of resources | The impact is result in a complete loss of all resources. |

CUMULATIVE EFFECT

This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.

| | | |
|---|------------------------------|---|
| 1 | Negligible cumulative impact | The impact would result in negligible to no cumulative effects. |
| 2 | Low cumulative impact | The impact would result in insignificant cumulative effects. |
| 3 | Medium cumulative impact | The impact would result in minor cumulative effects. |
| 4 | High cumulative impact | The impact would result in significant cumulative effects |

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance 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. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

| Points | Impact significance rating | Description |
|----------|----------------------------|--|
| 6 to 28 | Negative low impact | The anticipated impact will have negligible negative effects and will require little to no mitigation. |
| 6 to 28 | Positive low impact | The anticipated impact will have minor positive effects. |
| 29 to 50 | Negative medium impact | The anticipated impact will have moderate negative effects and will require moderate mitigation measures. |
| 29 to 50 | Positive medium impact | The anticipated impact will have moderate positive effects. |
| 51 to 73 | Negative high impact | The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact. |
| 51 to 73 | Positive high impact | The anticipated impact will have significant positive effects. |
| 74 to 96 | Negative very high impact | The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws". |
| 74 to 96 | Positive very high impact | The anticipated impact will have highly significant positive |

10.1 Summary of impact tables

The development footprint is completely underlain by the Vryheid Formation. The Palaeontological Sensitivity of this formation is rated Very High. The expected duration of the impact is assessed as potentially permanent to long term. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be **permanent**. Impacts on palaeontological heritage during the construction phase could potentially occur but are regarded as having a low possibility.

11 FINDINGS AND RECOMMENDATIONS

The development footprint is totally underlain by Precambrian dolomites and associated marine sedimentary rocks that are allocated to the Malmani Subgroup (Chuniespoort Group) within the Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Malmani Subgroup is Very High (Almond and Pether 2008, SAHRIS website).

It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. It is

considered that the development of the proposed Development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area.

A site specific field survey of the development footprint were conducted on foot and by motor vehicle on 27th April 2019. No visible evidence of fossiliferous outcrops were found. This area has also been extensively utilized by agriculture activities during the past. For this reason, an overall **low palaeontological sensitivity** is allocated to the development footprint. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of Kangala Extension Project will be of a **low significance** in palaeontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the **construction of the development may be authorised in its whole extent**, as the development footprint is not considered sensitive in terms of palaeontological resources.

In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations the **Chance Find Protocol** must be implemented by the ECO in charge of these developments. These discoveries ought to be protected (if possible *in situ*) 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 correct mitigation (e.g. recording and collection) can be carry out by a paleontologist.

Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA.

12 CHANCE FINDS PROTOCOL

A following procedure will only be followed in the event that fossils are uncovered during excavation.

12.1 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.

12.2 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.

12.3 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 Control Officer (ECO) 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 ECO, 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.

12.4 Chance find procedure

- If a chance find is made the person responsible for the find must immediately **stop working** and all work 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 ECO or site manager. The ECO 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 ECO (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 ECO (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.

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Appendix: 1: CV

ELIZE BUTLER

PROFESSION: Palaeontologist
YEARS' EXPERIENCE: 25 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 and Collection Manager | National Museum, Bloemfontein 1998–currently |

TECHNICAL REPORTS

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Butler, E. 2018. Palaeontological field assessment of the proposed construction of the Zonnebloem Switching Station (132/22kV) and two loop-in loop-out power lines (132kV) in the Mpumalanga Province. Bloemfontein.

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